TOSHIBA

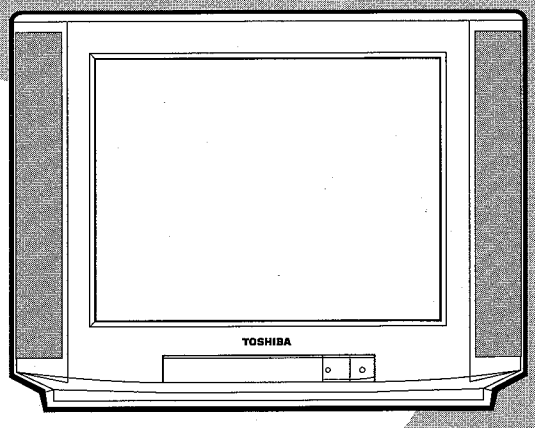
FILE NO. 030-9709

SERVICE MANUAL

COLOUR TELEVISION

C7S Chassis

2173DF, 2173DD



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CHAPTER 1 GENERAL ADJUSTMENTS

SAFETY INSTRUCTIONS

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" INSTRUCTIONS BELOW.

X-RAY RADIATION PRECAUTION

1. Excessive high voltage can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not be above the specified limit. The nominal value of the high voltage of this receiver is Ⓐ kV at zero beam current (minimum brightness) under a Ⓒ V AC power source. The high voltage must not, under any circumstances, exceed Ⓑ kV.

   Refer to table-1 for high voltage Ⓐ, Ⓑ & AC voltage Ⓒ. (See SETTING & ADJUSTING DATA on page 16)

   Each time a receiver requires servicing, the high voltage should be checked following the HIGH VOLTAGE CHECK procedure in this manual. It is recommended that the reading of the high voltage be recorded as a part of the service record. It is important to use an accurate and reliable high voltage meter.
2. The only source of X-RAY RADIATION in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type tube as specified in the parts list.
3. Some part in this receiver have special safety-related characteristics for X-RAY RADIATION protection. For continued safety, parts replacement should be undertaken only after referring to the PRODUCT SAFETY NOTICE below.

SAFETY PRECAUTION

WARNING : Service should not be attempted by anyone unfamiliar with the necessary precautions on this receiver. The following are the necessary precautions to be observed before servicing this chassis.

1. An isolation transformer should be connected in the power line between the receiver and the AC line before any service is performed on the receiver.
2. Always discharge the picture tube anode to the CRT conductive coating before handling the picture tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled. Use shatter proof goggles and keep picture tube away from the unprotected body while handling.
3. When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as; non-metallic control knobs, insulating covers, shields, isolation resistor-capacitor network etc.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this manual and its supplements; electrical components having such features are identified by the international hazard symbols on the schematic diagram and the parts list.
Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock, fire, X-ray radiation or other hazards.

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" ON PAGE 3 OF THIS MANUAL.

SET-UP ADJUSTMENT

■ The following adjustments should be made when a complete realignment is required or a new picture tube is installed. Perform the adjustments in order as follows :

1. Color Purity
2. Convergence
3. White Balance

Note: The PURITY/CONVERGENCE MAGNET assembly and rubber wedges need mechanical positioning. Refer to figure 1.

* There are no adjustment of purity and convergence in some picture tube (Unified with purity magnet)

COLOR PURITY ADJUSTMENT

NOTE : Before attempting any purity adjustments, the receiver should be operated for at least fifteen minutes.

1. Demagnetize the picture tube and cabinet using a degaussing coil.
2. Set the brightness and contrast to maximum.
3. Use a green raster from among the built-in test signals.
4. Loosen the clamp screw holding the yoke and slide the yoke backward or forward to provide vertical green belt (zone) in the picture screen.
5. Remove the Rubber Wedges.
6. Rotate and spread the tabs of the purity magnet (See figure 2.) around the neck of the picture tube until the green belt is in the center of the screen. At the same time, enter the raster vertically.
7. Slowly move the yoke forward or backward until a uniform green screen is obtained. Tighten the clamp screw of the yoke temporarily.
8. Check the purity of the red and blue raster.

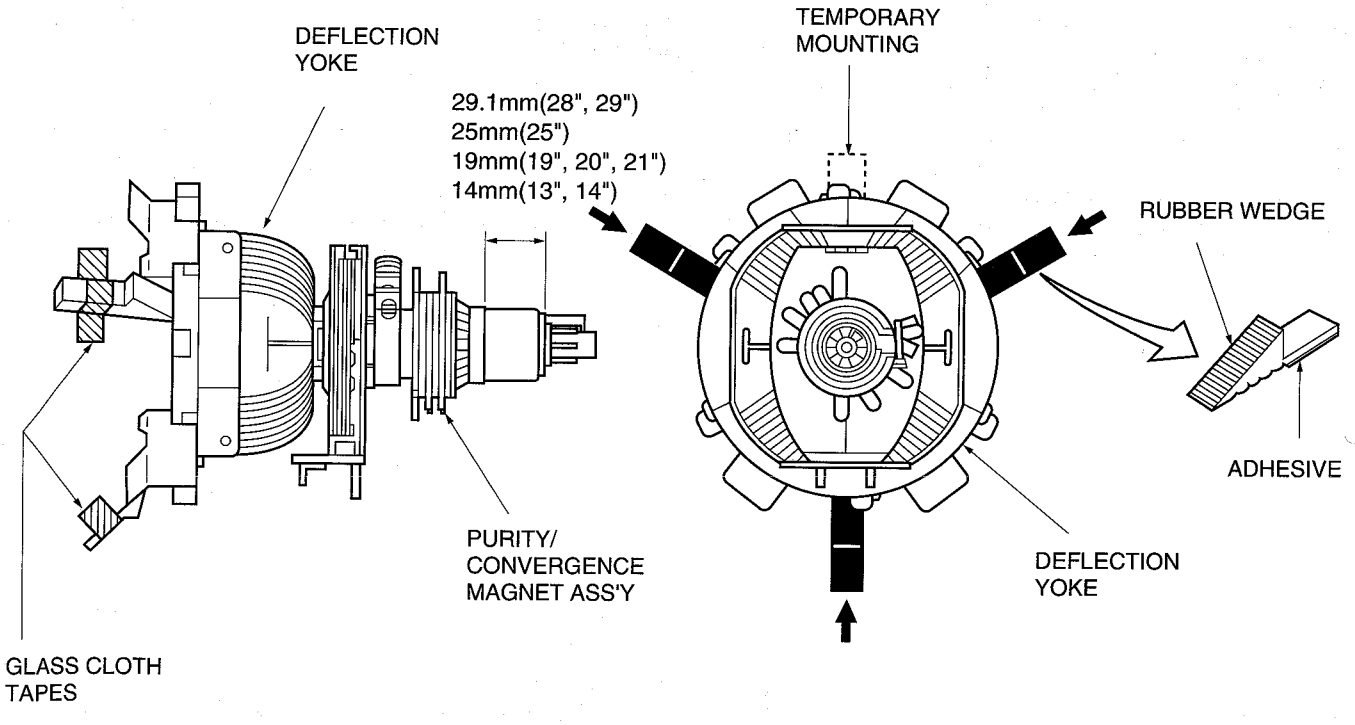


Figure 1.

CONVERGENCE ADJUSTMENTS

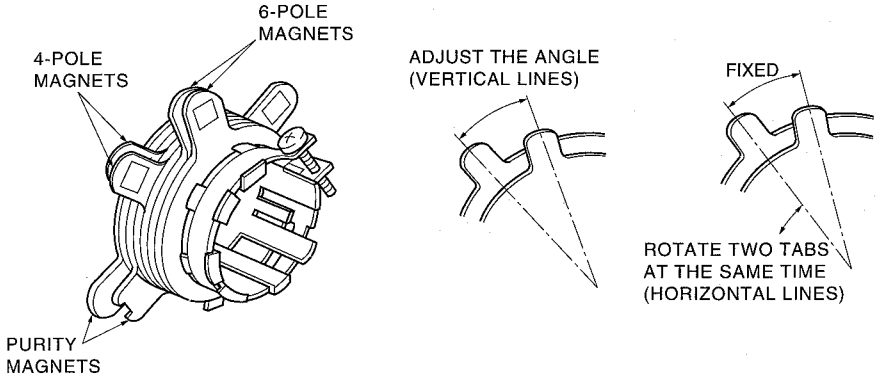
NOTE: Before attempting any convergence adjustments, the receiver should be operated for at least fifteen minutes.

■ CENTER CONVERGENCE ADJUSTMENT

1. Use the cross-dot pattern from among the built-in test signals.
2. Set the brightness and contrast for well defined pattern.
3. Adjust two tabs of the 4-Pole Magnets to change the angle between them (See figure 2.) and superimpose red and blue vertical lines in the center area of the picture screen.
4. Turn the both tabs at the same time keeping the angle constant to superimpose red and blue horizontal lines at the center of the screen.
5. Adjust two tabs of 6-Pole Magnets to superimpose red/blue line and green one. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines.
6. Repeat adjustments 3, 4, 5 keeping in mind red, green and blue movement, because 4-Pole Magnets and 6-Pole Magnets have mutual interaction and make dot movement complex.

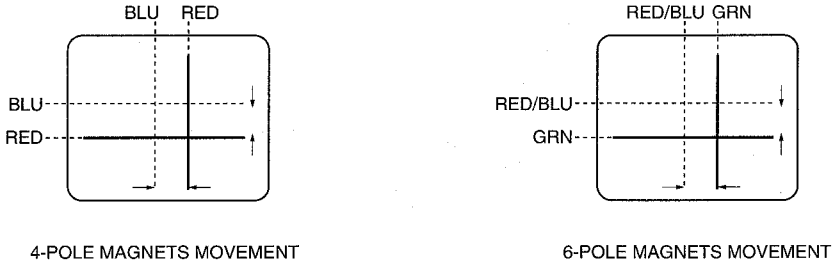
■ CIRCUMFERENCE CONVERGENCE ADJUSTMENT

1. Loosen the clamping screw of deflection yoke slightly to allow the yoke to tilt.
2. Temporarily put a wedge as shown in figure 1. (Do not remove cover paper on adhesive part of the wedge.)
3. Tilt front of the deflection yoke up or down to obtain better convergence in circumference. (See figure 3.) Push the mounted wedge into the space between picture tube and the yoke to fix the yoke temporarily.
4. Put other wedge into bottom space and remove the cover paper to stick.
5. Tilt front of the yoke right or left to obtain better convergence in circumference. (See figure 3.)
6. Keep the yoke position and put another wedge in either upper space. Remove cover paper and stick the wedge on picture tube to fix the yoke.
7. Detach the temporarily mounted wedge and put it in another upper space. Stick it on picture tube to fix the yoke.
8. After fixing three wedges, recheck overall convergence. Tighten the screw firmly to fix the yoke and check the yoke is firm.
9. Stick three adhesive tapes on wedges as shown in figure 1.



CONVERGENCE MAGNET ASSEMBLY — ADJUSTMENT OF MAGNETS

Figure 2.



4-POLE MAGNETS MOVEMENT — 6-POLE MAGNETS MOVEMENT

Center Convergence by Convergence Magnets

INCLINE THE YOKE UP (OR DOWN) — INCLINE THE YOKE RIGHT (OR LEFT)

Circumference Convergence by DEF Yoke

Figure 3. Dot Movement Pattern

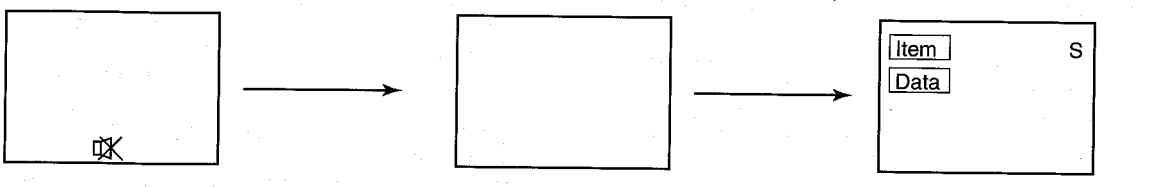
SERVICE MODE

1. ENTERING TO SERVICE MODE

1) Press 🔇 button once on Remote Control.

2) Press 🔇 button again to keep pressing.

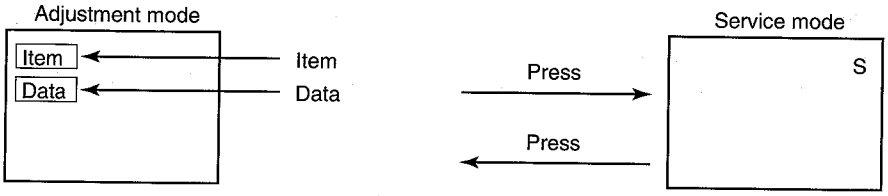
3) While pressing the 🔇 button, press MENU button on TV set.



(Service mode display)

2. DISPLAYING THE ADJUSTMENT MENU

1) Press MENU button on TV.



3. KEY FUNCTION IN THE SERVICE MODE

The following key entry during display of adjustment menu provides special functions.

A single horizontal line ON/OFF:	- / - - button (on Remote) or ⊖ button (on TV)
Test signal selection :	⊖ button (on Remote)
Selection of the adjustment items :	CHANNEL ▲/▼ (on TV & Remote)
Change of the data value :	VOLUME ◿ +/– (on TV & Remote)
Adjustment menu mode ON/OFF :	MENU button on TV
Initialization of the memory (QA02) :	CALL + CHANNEL button on TV (▲)
Reset the count of operating protect circuit to "00":	CALL + CHANNEL button on TV (▼)
"RCUT" selection :	1 button
"GCUT" selection :	2 button
"BCUT" selection :	3 button
"CNTX" (or "SCNT") selection :	4 button
"COLC" selection :	5 button– – – – Color thickness correction
"TNTC" selection :	6 button note: Displayed differently as shown below, de-
Test audio signal ON/OFF (1kHz) :	8 button pending on the setting of the receiving color
Self diagnostic display ON/OFF :	9 button system.
	COLP (PAL)
	COLC (NTSC)
	COLS (SECAM)

CAUTION : Never try to perform initialization unless you have changed the memory IC.

4. SELECTING THE ADJUSTING ITEMS

1) Every pressing of CHANNEL ▲ button in the service mode changes the adjustment items in the order of table-2. (▼ button for reverse order)

Refer to table-2 for preset data of adjustment mode. (See SETTING & ADJUSTING DATA on page 16)

5. ADJUSTING THE DATA

1) Pressing of VOLUME ◿ +/– button will change the value of data in the range from 00H to FFH. The variable range depends on the adjusting item.

6. EXIT FROM SERVICE MODE

1) Pressing POWER button to turn off the TV once.

■ INITIALIZATION OF MEMORY DATA OF QA02

After replacing QA02, the following initialization is required.

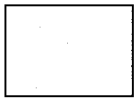
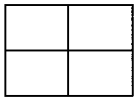
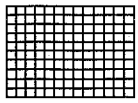
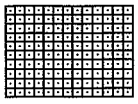
1. Enter the service mode, then select any register item.
2. Press and hold the CALL button on the Remote, then press the CHANNEL ▲ button on the TV. The initialization of QA02 has been complated.
3. Check the picture carefully. If necessary, adjust any adjustment item above. Perform "Auto search Memory" on the owner's manual.

CAUTION: Never attempt to initialize the data unless QA02 has been replaced.

7. TEST SIGNAL SELECTION

Every pressing of –⊖ button on the Remote Control changes the built-in test patterns on screen as described below in SERVICE MODE.

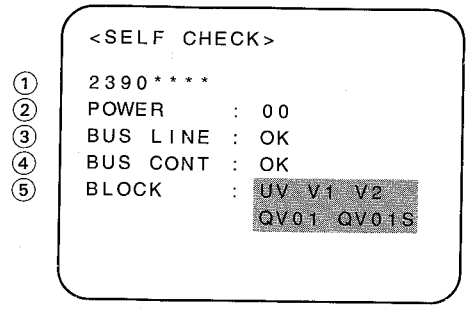
Signal off ⟶ NTSC signals (14 patterns)
⟵ PAL signals (14 patterns) ⟵

Signals	Picture
• Red raster • Green raster • Blue raster • All Black • All White	
• Black & White	
• Black cross-bar • White cross-bar • Black cross-bar on green raster	
• Black cross-hatch • White cross-hatch	
• Black cross-dot • White cross-dot	
• H signal (white) • H signal (black)	

* The signals marked with ▒ are not usable to display in the Test signal for some model.

8. SELF DIAGNOSTIC FUNCTION

1) Press "9" button on Remote Control during display of adjustment menu in the service mode.
   The diagnosis will begin to check if interface among IC's are executed properly.
2) During diagnosis, the following displays are shown.



① Part number of microcomputer (QA01)
② Operation number of protecting circuit ----"00" is normal.
When indication is other than "00", overcurrent apts to flow, and circuit parts may possibly be damaged.
③ BUS LINE CHECK ----"OK" is normal.
"SCL(SCL1)-GND" ..... SCL-GND short circuit
"SDA(SDA1)-GND" ..... SDA-GND short circuit
"SCL(SCL1)-SDA (SDA1)" ... SCL-SDA short circuit
④ BUS CONT ----"OK" is normal.
When indication shows "Q ○○○ NG", the device with the number may possibly be damaged.
⑤ BLOCK
UV : TV reception mode
V1 : VIDEO 1 input mode (←①1)
V2 : VIDEO 2 input mode (←①2)

Indicated color of mode now selected : Green and Red
Indicated color of other modes : White

Green : Normal
Red : The microcomputer operates to provide judgement of no video signal. The red color is still indicated though the signal is input, failure may exist in input signal line including QV01.
QV01 : In case of indication green ---Normal
In case of indication red with input signal----
Failure may exist in output line including QV01.

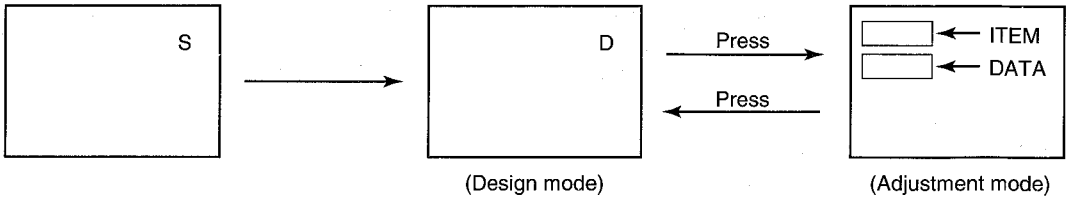
NOTE: Component which controls character display on screen is QT01 (TELETEXT IC.). If this display function fails to operate due to damage in QT01, self diagnosis procedure is as follows.
(1) In case that power indicator is blinking with interval of 0.5 seconds; it means protecting circuit (Current limiter) is operating, and circuit components may possibly be damaged. Check related components.
(2) In case that power indicator is blinking with interval of 1 second; Protecting circuit does not operate, but a part of Bus line does not operate normally. Check Bus line.

* The items marked with ▒ are not usable to display in the SELF DIAGNOSTIC FUCTION for some model.

DESIGN MODE

1. ENTERING TO DESIGN MODE

1) Select the Service mode. 2) While pressing 🔇 (or CALL) button on Remote and press MENU button on TV. 3) Press MENU button on TV.



When QA01 is initialized, items "OPT0" and "OPT1" of DESIGN MODE are set to the data of the representative model of this chassis family.
Therefore, because ON-SCREEN specification remains in the state of the representative of model. This model is required to reset the data of items "OPT0" and "OPT1".

2. SELECTING THE ADJUSTING ITEMS

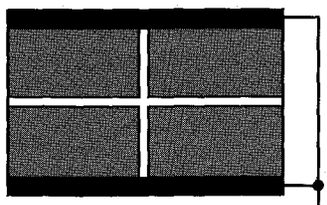
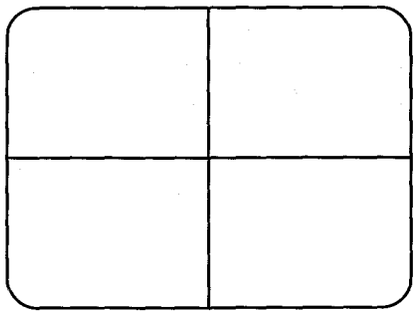
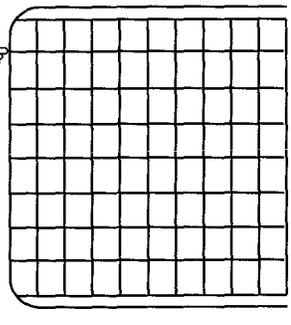
Every pressing of CHANNEL ▼ button in the design mode changes the adjustment items in the order of table-3.
(▲ button for reverse order)

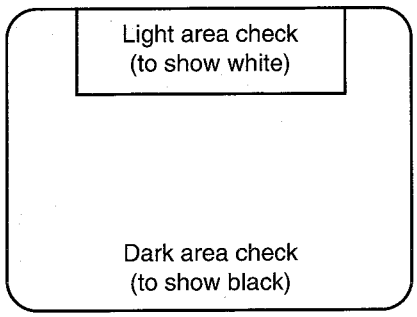
Refer to table-3 for data of design mode.
(See SETTING & ADJUSTING DATA on page 17)

3. ADJUSTING THE DATA

Pressing of VOLUME ▲ or ▼ (◿ +/–) button will change the value of data.

ELECTRICAL ADJUSTMENTS

ITEM	ADJUSTMENT PROCEDURE
FOCUS VR ADJ.	1. Enter the service mode, then select any register item. 2. Press the TV/VIDEO button on the Remote until the black cross-bar pattern appears on the screen. 3. Adjust the FOCUS control (on T461) for well defined scanning lines on the picture screen.
SUB-BRIGHTNESS (BRTC) Note: Constrict the picture height until the vertical retrace line appears adjusting the item HIT (HEIGHT).	1. Set CONTRAST to minimum, and BRIGHTNESS to center by adjusting user controls. 2. Set the TV in service mode to get white cross-bar of inside pattern. 3. Select BRTC (brightness correction), and adjust the ◿ – /+ button to reduce the value so that white portion of inside pattern slightly light. 4. Adjust ◿ – /+ button to increase the data value of BRTC, and set it just before the difference between the belt of vertical retrace and the border of black portion of inside pattern is visible. After that, return vertical height and contrast.  Belt of vertical retrace
HORIZONTAL POSITION ADJUSTMENT (HPOS) VERTICAL POSITION ADJUSTMENT (VPOS)	1. Set the TV in service mode, and get black or white cross-bar signal with VIDEO button on remote hand unit. 2. Select either HPOS (Horizontal picture phase) or VPOS (Vertical picture phase) with CHANNEL ▲, ▼ buttons, and adjust horizontal or vertical picture position in the center of screen with VOLUME ◿ – /+ buttons. 
VERTICAL AMPLITUDE ADJUSTMENT (HIT)	1. Set the TV in service mode, and get black or white cross-hatch signal with VIDEO button on remote hand unit. 2. Select HIT (Vertical amplitude) with CHANNEL ▲, ▼ buttons, and adjust vertical amplitude with VOLUME ◿ – /+ buttons so that vertical amplitude lacks a little. 3. Adjust vertical amplitude with VOLUME ◿ – /+ buttons so that the first bar on cross-hatch signal touches edge of screen. The first ☞ 

ITEM	ADJUSTMENT PROCEDURE
WHITE BALANCE ADJUSTMENT ● CUTOFF ADJUSTMENT (RCUT) (GCUT) (BCUT) ● DRIVE ADJUSTMENT (GDRV) (BDRV)	1. Set Contrast to 40, and brightness to +20 by picture control. 2. Set the TV in service mode, and get the inside W/B adjusting signal with VIDEO button. 3. Select RCUT, GCUT and BCUT with CHANNEL ▲, ▼ buttons, to set individual values to initial, and to set GDRV and BDRV to initial reference data (See page 16) with VOLUME ◢ – /+ buttons. 4. Press -/- - button on the remote control and rotate Screen VR to get one slight horizontal line on screen. Note: Every pressing of -/- - button provides Horizontal line picture and Normal picture alternately. 5. Press -/- - button to release horizontal line picture, and select the two other colors which did not light in the above step with CHANNEL ▲, ▼ buttons. Then tap VOLUME ◢ – /+ buttons so that three colors slightly light in the same level. ※ To correct white balance in light area, select GDRV and BDRV with CHANNEL ▲, ▼ buttons to adjust. ※ To correct white balance in dark area, perform fine adjustment of RCUT, GCUT and BCUT. 

Model Name C7S (2173 Series) (Reference factory adjustment)

Adjustment Part	Input point / Output point	Adjustment signal	Adjustment condition and procedure
H.CENT	Visual adjustment with a picture (Bus control)	WG Philips pattern Do not use the Philips pattern for France SECAM.	1. Condition : Cont. - max., Bright - cent., Color - cent. 2. Adjustment procedure a. Adjust the sub-address HPOS to adjust the screen center. (Minimize D-C by the CRT adjustment magnetic field.)
HEIGHT VERT. POSITION	Visual adjustment with a picture (Bus control)	WG Philips pattern Do not use the Philips pattern for France SECAM.	1. Condition : Cont. - max., Bright - cent., Color - cent. 2. Adjustment procedure a. Adjust V.Position by the sub-address VPOS so that the vertical center of the circle of the Philips pattern comes to the center of the screen. b. Adjust the screen by the sub-address HIT so that the top and bottom flags the Philips pattern just go off behind the frame.

Model Name C7S

Item	Name	Setting (user control)	Input signal	Measurement point	Adjustment procedure	Adjustment standard
BRTC	Sub-bright adjustment	Contrast : Max. Bright : Center Color : Min.	Sub-bright signal	Screen adjustment	① This item shall be adjusted after the screen VR adjustment and white balance adjustment. ② Adjust the number of collapsed black lines of the sub-bright signal.	4 ± 1.5 lines
SCNT No adjustment	Sub-contract adjustment	Contrast : Max. Bright : Center Color : Min.	Sub-bright signal	IC501 #12 B-OUT	① Select SCNT. ② By selecting SCNT, B/W mode is activated. ③ Adjust the white level amplitude from the pedestal level of Y-signal. *Using the screen VR, adjust the amplitude at the point which is not fluctuated.	For UK model : 2.5 ± 0.2V(o-p) For other models : 2.3 ± 0.2V(o-p)
COLP	Sub-color adjustment (PAL)	Contrast : Max. Bright : Center Color : Center	Sub-bright signal	IC501 #12 B-OUT	① Select COLP. ② By selecting COLP, the Y-signal is muted and only color signals are outputted. ③ Adjust the upper half of the amplitude of the rainbow color bar signal output.	1.25 ± 0.15V(o-p)
RCUT GCUT BCUT Screen VR	Screen adjustment and white balance adjustment (R cutoff) (G cutoff) (B cutoff) (Screen)	RCUT GCUT BCUT } 40H GDRV BDRV } 80H Activate horizontal straight line mode. (Local video key)		Screen adjustment	① Set the conditions as shown left. ② Gradually raise the screen brightness until either of R, G or B line starts to gleam slightly. ③ Determine that point as the screen VR adjustment position. ④ Using RCUT, GCUT and BCUT, raise the brightness of two lines except the one that gleamed in the step ② until these lines start to gleam slightly. (i.e. make the screen almost white.) ⑤ Release the horizontal straight line mode. (Local video key) ⑥ Using the white balance checker, repeat the adjustment steps until both bright and dark parts becomes correct value.	HIGH LIGHT (103cd/m²) 8750K –0.002uv DARK (17cd/m²) 8750K –0.002uv * Adjustment range is the same as before.

Model Name : C7S
(Only for the sets with SECAM function)

Item	Name	Setting (user control)	Input signal	Measurement point	Adjustment procedure	Adjustment standard
SRY SBY	SECAM black level adjustment R-Y axis B-Y axis	Cont. : Max. Bright : Center Color : Center	SECAM color bar signal	IC501 #35 (R-Y axis) #36 (B-Y axis)	① Adjust the level of B/W part of the color difference signal to the level of H, BLK part. ② Adjust the R-Y axis and B-Y axis by SRY and SBY respectively.	Below ±10mV for both axis.
BELL	SECAM bell filter adjustment	Cont. : Max. Bright : Center Color : Center	SECAM color bar signal	IC501 #36 (B-Y axis)	① Connect #26 of IC501 and 5V with 1kΩ. ② Set "04H" to the data of COLC. ③ Deform BELL and adjust the output waveform flat. ④ Disconnect the resistor of ① and restore COLC.	Waveform flat
COLS No adjustment	SECAM color level adjustment	Cont. : Max. Bright : Center Color : Center	SECAM color bar signal	IC501 #12 B-OUT	Adjust the R-Y amplitude. (Positive side). * This adjustment must be done after the COLP adjustment.	1.75 ± 0.2V(o-p)

CIRCUIT CHECK

HIGH VOLTAGE CHECK

CAUTION: There is no HIGH VOLTAGE ADJUSTMENT on this chassis. Checking should be done following the steps below.

1. Connect an accurate high voltage meter to the second anode of the picture tube.
2. Turn on the receiver. Set the BRIGHTNESS and CONTRAST controls to minimum (zero beam current).
3. High voltage must be measured below Ⓑ kV.

Refer to table-1 for high voltage Ⓑ.
(See SETTING & ADJUSTING DATA on page 16)

4. Vary the BRIGHTNESS control to both extremes to be sure the high voltage does not exceed the limit under any conditions.

SETTING & ADJUSTING DATA

【 SAFETY INSTRUCTIONS 】

		21"
HIGH VOLTAGE AT ZERO BEAM:	Ⓐ	29.1 kV
MAX HIGH VOLTAGE:	Ⓑ	29.5 kV
AC VOLTAGE:	Ⓒ	220~240 V

Table-1

【 SERVICE MODE 】

ADJUSTING ITEMS AND DATAS IN THE SERVICE MODE:

Item	Name of adjustment	Preset Data	2173DF Data	2173DD Data
RCUT	R CUTOFF	40H	←	←
GCUT	G CUTOFF	40H	←	←
BCUT	B CUTOFF	40H	←	←
GDRV	G DRIVE	80H	←	←
BDRV	B DRIVE	80H	←	←
CNTX	SUB CONTRAST MAX	FFH	←	←
BRTC	SUB BRIGHT CEN	80H	←	←
COLC	SUB COLOR CEN NTSC	00H	←	←
TNTC	SUB TINT CEN	40H	←	←
COLP	SUB COLOR CEN PAL	80H	←	←
COLS	SUB COLOR CEN SECAM	00H	←	←
SCNT	Y-SUB CONTRAST	0AH	←	←
HPOS	50Hz H-POSITION	05H	←	←
VPOS	50Hz V-POSITION	03H	←	←
VPSS	60Hz -V-POSITION	00H	←	←
HIT	50Hz H-WIDTH	40H	←	←
VLIN	50Hz V-LINEARITY	13H	←	←
BELL	BELL FILTER	01H	←	←
TRP	CROMA TRAP f0	02H	←	←
SBY	SECAM B-Y	08H	←	←
SRY	SECAM R-Y	08H	←	←

Table-2

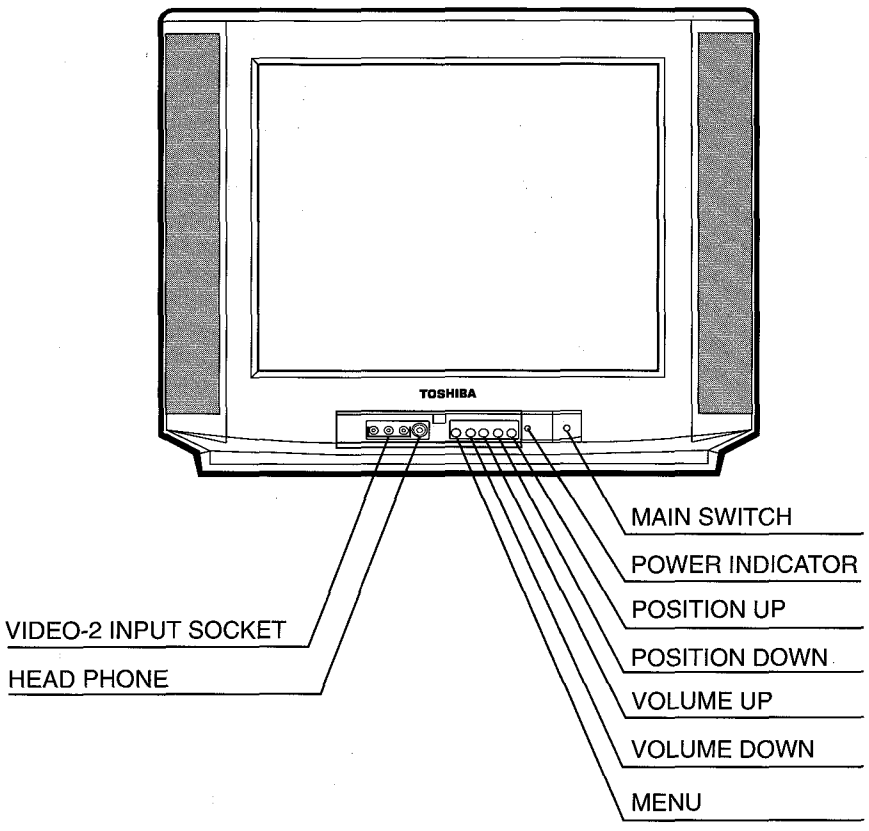
【DESIGN MODE】

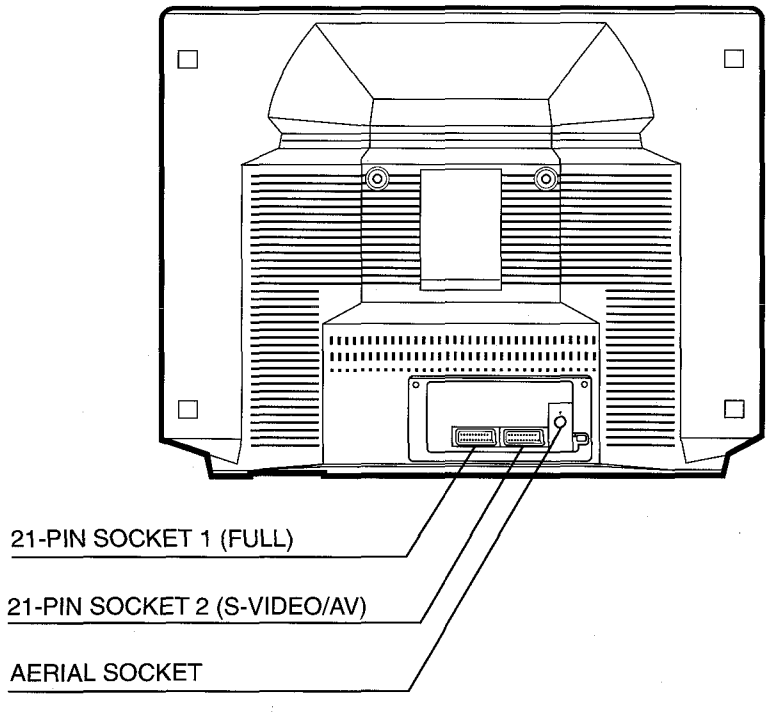
ADJUSTING ITEMS AND DATAS IN THE DESIGN MODE:

Item	Name of adjustment	Data			Remarks
		Preset Data	2173DF	2173DD	
RCUT					
OPT	OPTION	A9H	DAH	D0H	
OPT2	OPTION 2	00H	00H	00H	
OSD					
.					
.					
.					
.					
RCUT					

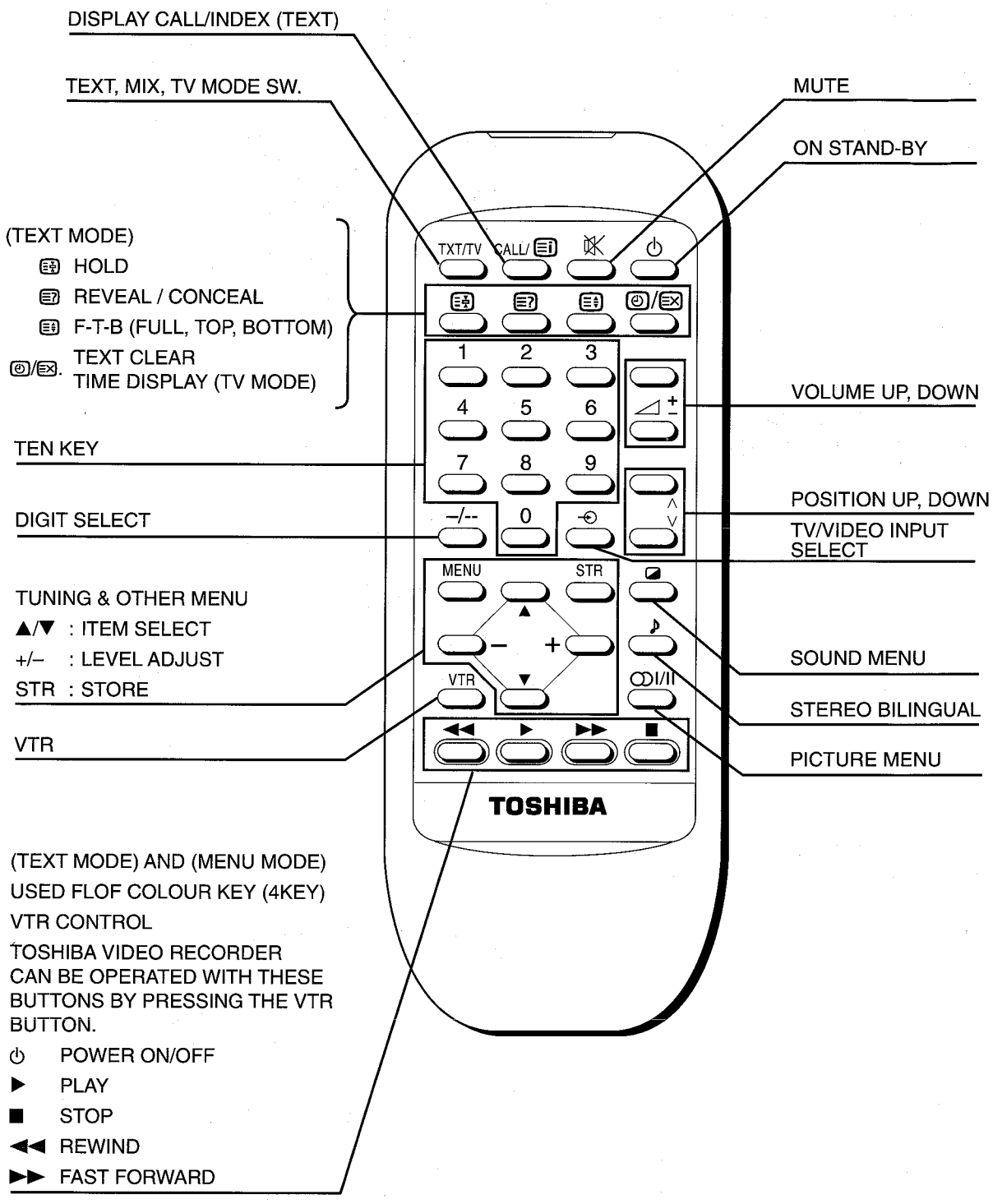
Table-3

LOCATION OF CONTROLS (TV SET)



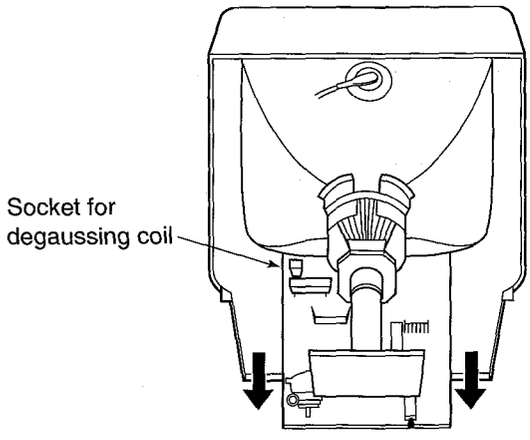


LOCATION OF CONTROLS (REMOTE CONTROL)

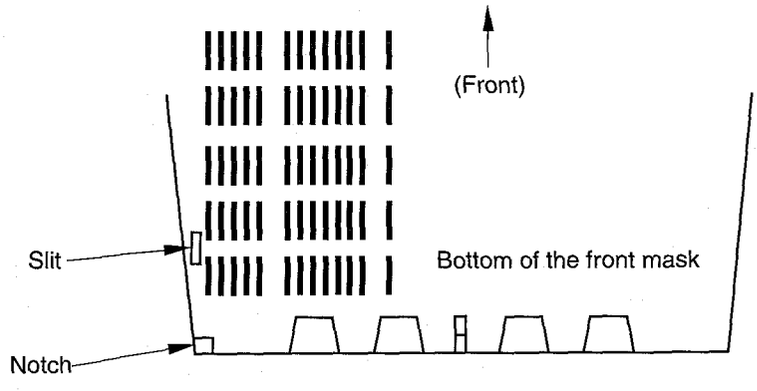


SERVICE POSITION

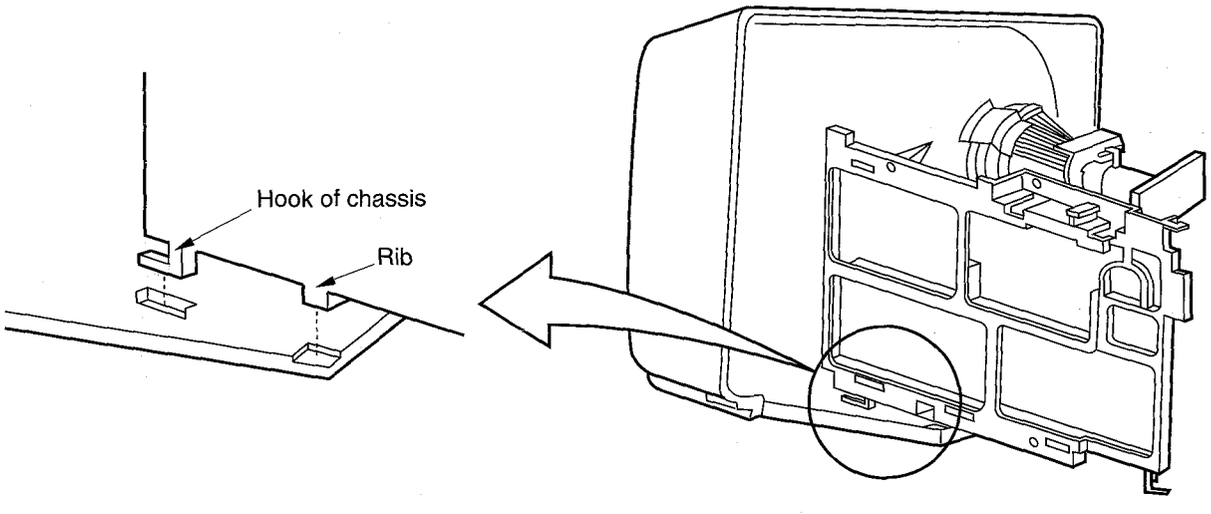
1. Remove socket of degaussing coil lead and the lead wires from holders of back board, and draw out chassis.



2. Lift up the chassis and insert the L-shape hook of chaais frame into the slit on bottom of front mask.

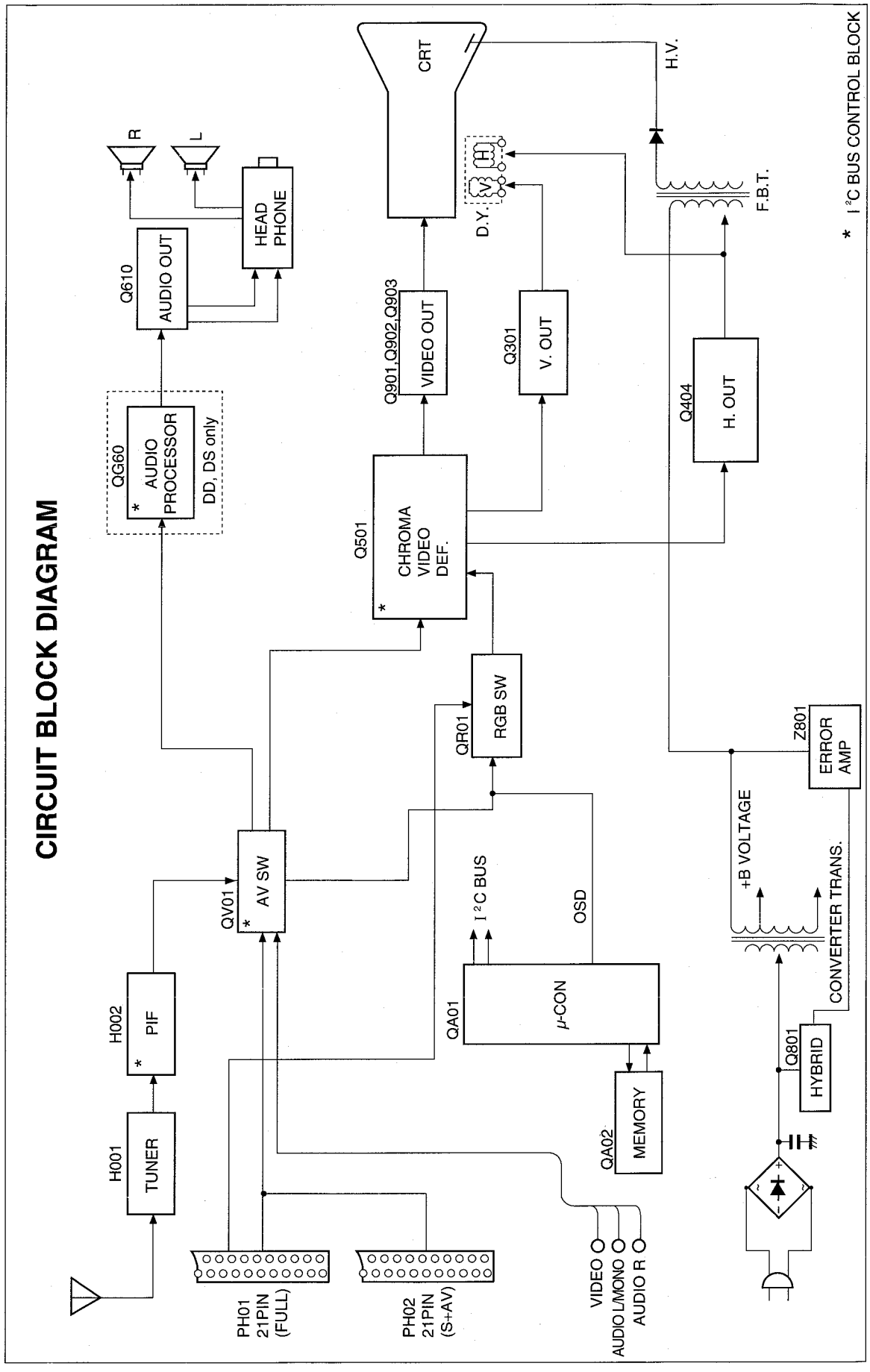


3. Put the chassis on the bottom of front mask to make fit the rib of chassis frame to notch of front mask.

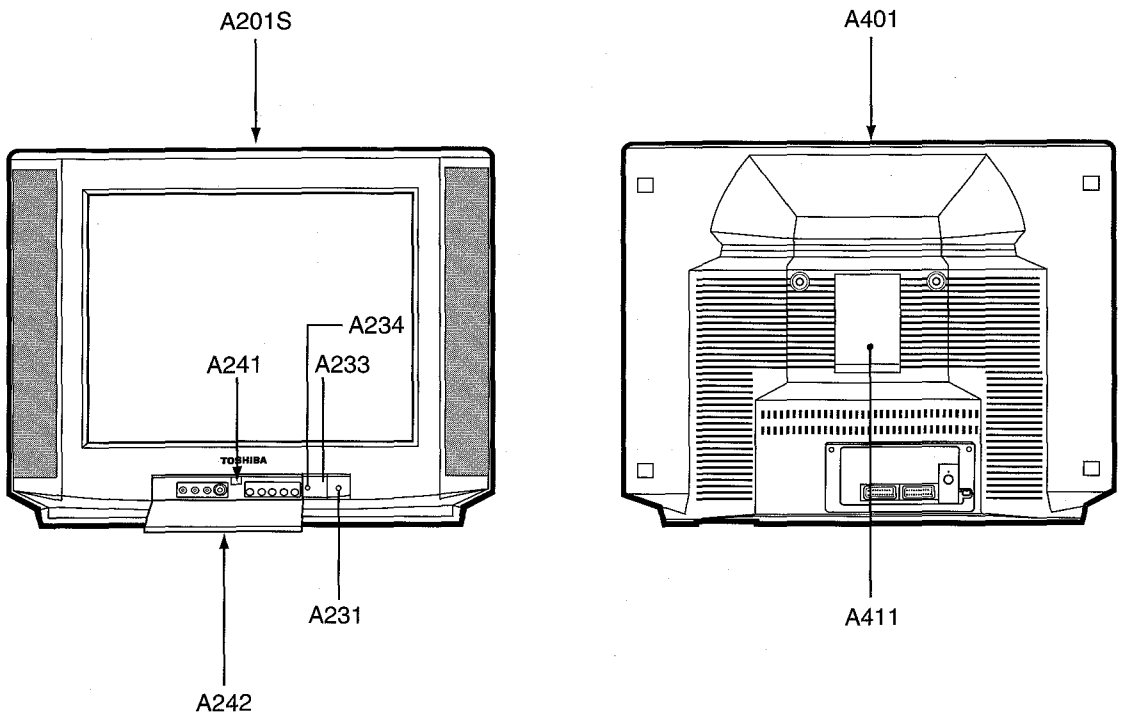


4. When restoring chassis, arrange wires and cables in the original positions.

CIRCUIT BLOCK DIAGRAM



CABINET REPLACEMENT PARTS LIST



Location No.	Part No.	Description
A201S	23410990	Front Cover
A231	23444871	Button, Power
A233	23430306	Lens, Remote
A234	23430307	Piece, LED
A241	70368125	Push Catch for Door
A242	23426842	Door, Proper
⚠A401	23426812	Back Cover
A411	23560543	Label, Model No.

CHASSIS REPLACEMENT PARTS LIST

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" ON PAGE 3 OF THIS MANUAL.

CAUTION: The international hazard symbols "⚠" in the schematic diagram and the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list. The mounting position of replacements is to be identical with originals. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE on page 3. Do not degrade the safety of the receiver through improper servicing.

NOTICE:
- *The part number must be used when ordering parts, in order to assist in processing, be sure to include the Model number and Description.*
- *The PC board assembly with ∗ mark is no longer available after the end of the production.*

Models : 2173DF, 2173DD

Capacitors	CD	: Ceramic Disk	PF	: Plastic Film	EL	: Electrolytic
Resistors	CF	: Carbon Film	CC	: Carbon Composition	MF	: Metal Film
	OMF	: Oxide Metal Film	VR	: Variable Resistor	FR	: Fusible Resistor

(All CD and PF capacitors are ±5%, 50V and all resistors, ±5%, 1/6W unless otherwise noted.)

Location No.	Part No.	Description
CAPACITORS		
C101	24797229	EL, 2.2μF, ±20%, 50V
C102	24794221	EL, 220μF, ±20%, 16V
C103	24794101	EL, 100μF, ±20%, 16V
C104	24232103	CD, 0.01μF, +80%, −20%
C105	24212102	CD, 1000pF, ±10%
C106	24669100	EL, 10μF, ±20%, 50V
C107	24793101	EL, 100μF, ±20%, 10V
C108	24793101	EL, 100μF, ±20%, 10V
C111	24669479	EL, 4.7μF, ±20%, 50V
C112	24669479	EL, 4.7μF, ±20%, 50V
C114	24474151	CD, 150pF, ±10%
C115	24797478	EL, 0.47μF, ±20%, 50V
C116	24797478	EL, 0.47μF, ±20%, 50V
C212	24797010	EL, 1μF, ±20%, 50V
C213	24794220	EL, 22μF, ±20%, 16V
C214	24232103	CD, 0.01μF, +80%, −20%
C215	24794470	EL, 47μF, ±20%, 16V
C216	24797010	EL, 1μF, ±20%, 50V
C217	24797479	EL, 4.7μF, ±20%, 50V
C218	24590104	PF, 0.1μF
C220	24206108	EL, 0.1μF, 50V
C221	24206108	EL, 0.1μF, 50V
C222	24206108	EL, 0.1μF, 50V
C301	24617912	EL, 2.2μF, ±10%, 50V
C303	24212472	CD, 4700pF, ±10%
C304	24214471	CD, 470pF, ±10%, 500V
C305	24617912	EL, 2.2μF, ±10%, 50V
C306	24073057	EL, 1000μF, ±20%, 25V
C307	24082049	PF, 0.047μF, 100V
C308	24668221	EL, 220μF, ±20%, 35V
C309	24590102	PF, 1000pF
C310	24796102	EL, 1000μF, ±20%, 35V
C311	24214391	CD, 390pF, ±10%, 500V
C313	24082057	PF, 0.22μF, 100V
C314	24590563	PF, 0.056μF
C315	24797010	EL, 1μF, ±20%, 50V
C320	24668101	EL, 100μF, ±20%, 35V
C323	24538684	PF, 0.68μF
C324	24539334	PF, 0.33μF
C341	24794101	EL, 100μF, ±20%, 16V

Location No.	Part No.	Description
C399X	24591182	PF, 1800pF
C402	24232103	CD, 0.01μF, +80%, −20%
C403	24590223	PF, 0.022μF
C404	24669229	EL, 2.2μF, ±20%, 50V
C406	24590104	PF, 0.1μF
C407	24232103	CD, 0.01μF, +80%, −20%
C409	24212221	CD, 220pF, ±10%
C410	24693472	PF, 4700pF, 100V
C413	24214222	CD, 2200pF, ±10%, 500V
C417	24214391	CD, 390pF, ±10%, 500V
C421	24794470	EL, 47μF, ±20%, 16V
C430	24232103	CD, 0.01μF, +80%, −20%
C431	24666221	EL, 220μF, ±20%, 16V
C432	24232103	CD, 0.01μF, +80%, −20%
C433	24794470	EL, 47μF, ±20%, 16V
C434	24665471	EL, 220μF, ±20%, 16V
C435	24666221	EL, 220μF, ±20%, 16V
C439	24232103	CD, 0.01μF, +80%, −20%
C440	24082476	PF, 5600pF, ±3%, 1500V
C442	24082696	PF, 0.39μF, 250V
C444	24082469	PF, 3600pF, ±3%, 1500V
C445	24828563	PF, 0.056μF, 200V
C446	24700220	EL, 22μF, ±20%, 250V
C448	24640908	EL, 33μF, ±20%, 160V
C449	24795102	EL, 1000μF, ±20%, 25V
C463	24212152	CD, 1500pF, ±10%
C467	24082850	PF, 0.03μF, ±3%, 630V
C470	24666220	EL, 22μF, ±20%, 16V
C472	24538474	PF, 0.47μF
C501	24797479	EL, 4.7μF, ±20%, 50V
C502	24590103	PF, 0.01μF
C503	24797229	EL, 2.2μF, ±20%, 50V
C504	24590104	PF, 0.1μF
C505	24590104	PF, 0.1μF
C508	24353120	CD, 12pF
C509	24794100	EL, 10μF, ±20%, 16V
C510	24232103	CD, 0.01μF, +80%, −20%
C511	24794101	EL, 100μF, ±20%, 16V
C512	24232103	CD, 0.01μF, +80%, −20%
C513	24232103	CD, 0.01μF, +80%, −20%
C514	24590104	PF, 0.1μF

Location No.	Part No.	Description
C515	24232103	CD, 0.01μF, +80%, −20%
C610	24794100	EL, 10μF, ±20%, 16V
C612	24794470	EL, 47μF, ±20%, 16V
C661	24590102	PF, 1000pF
C662	24590102	PF, 1000pF
C663	24794100	EL, 10μF, ±20%, 16V
C670	24667470	EL, 47μF, ±20%, 25V
C671	24667470	EL, 47μF, ±20%, 25V
C673	24669229	EL, 2.2μF, ±20%, 50V
C676	24591124	PF, 0.12μF
C677	24591124	PF, 0.12μF
C678	24669229	EL, 2.2μF, ±20%, 50V
C679	24667470	EL, 47μF, ±20%, 25V
C681	24668102	EL, 1000μF, ±20%, 35V
C682	24668101	EL, 100μF, ±20%, 35V
C683	24668102	EL, 1000μF, ±20%, 35V
C684	24232103	CD, 0.01μF, +80%, −20%
C685	24232103	CD, 0.01μF, +80%, −20%
C686	24212102	CD, 1000pF, ±10%
C687	24212102	CD, 1000pF, ±10%
C688	24232103	CD, 0.01μF, +80%, −20%
⚠C801	24082927	PF, 0.22μF, ±20%, AC275V
C805	24092281	CD, 4700pF, ±20%, AC250V
C806	24092281	CD, 4700pF, ±20%, AC250V
C810	24086037	EL, 270μF, ±20%, 400V
⚠C813	24092557	CD, 2200pF, ±20%, AC250V
⚠C814	24092557	CD, 2200pF, ±20%, AC250V
C831	24794470	EL, 47μF, ±20%, 16V
C841	24796100	EL, 10μF, ±20%, 35V
C842	24794100	EL, 10μF, ±20%, 16V
C843	24590104	PF, 0.1μF
C846	24538224	PF, 0.22μF
C861	24214471	CD, 470pF, ±10%, 500V
C862	24082857	PF, 680pF, ±2%
C863	24590104	PF, 0.1μF
C864	24092474	CD, 220pF, ±10%, 2kV
C866	24669478	EL, 0.47μF, ±20%, 50V
C867	24590272	PF, 2700pF
C868	24676470	EL, 47μF, ±20%, 100V
C869	24678229	EL, 2.2μF, ±20%, 200V
C870	24820273	PF, 0.027μF, 630V
C871	24092345	CD, 1000pF, ±10%, 2kV
C873	24538224	PF, 0.22μF
C877	24667470	EL, 47μF, ±20%, 25V
C883	24538474	PF, 0.47μF
C884	24086953	EL, 220μF, ±20%, 160V
C885	24214471	CD, 470pF, ±10%, 500V
C886	24214471	CD, 470pF, ±10%, 500V
C889	24668222	EL, 2200μF, ±20%, 35V
C891	24082229	PF, 0.1μF, ±10%, 250V
C893	24092338	CD, 270pF, ±10%, 2kV
C894	24092338	CD, 270pF, ±10%, 2kV
C898	24212102	CD, 1000pF, ±10%
C901	24679479	EL, 4.7μF, ±20%, 250V
C902	24092345	CD, 1000pF, ±10%, 2kV
C941	24212561	CD, 560pF, ±10%
C942	24212561	CD, 560pF, ±10%
C943	24212561	CD, 560pF, ±10%
C971	24794220	EL, 22μF, ±20%, 16V
C972	24794100	EL, 10μF, ±20%, 16V
C980	24763471	EL, 470μF, ±20%, 16V
C981	24797479	EL, 4.7μF, ±20%, 50V
CA103	24474391	CD, 390pF, ±10%
CA23	24590104	PF, 0.1μF

Location No.	Part No.	Description
CA24	24590104	PF, 0.1μF
CA25	24590104	PF, 0.1μF
CA31	24794470	EL, 47μF, ±20%, 16V
CA35	24474101	CD, 100pF, ±10%
CA38	24232103	CD, 0.01μF, +80%, −20%
CA39	24232103	CD, 0.01μF, +80%, −20%
CA41	24436560	CD, 56pF
CA42	24436560	CD, 56pF
CA43	24232103	CD, 0.01μF, +80%, −20%
CA44	24232103	CD, 0.01μF, +80%, −20%
CA45	24797100	EL, 10μF, ±20%, 50V
CA68	24794100	EL, 10μF, ±20%, 16V
CA69	24232103	CD, 0.01μF, +80%, −20%
CB01	24794470	EL, 47μF, ±20%, 16V
CB09	24763331	EL, 330μF, ±20%, 16V
CB10	24797010	EL, 1μF, ±20%, 50V
CB11	24436181	CD, 180pF
CB12	24212561	CD, 560pF, ±10%
CB13	24212472	CD, 4700pF, ±10%
CB20	24212221	CD, 220pF, ±10%
CB21	24212221	CD, 220pF, ±10%
CC14	24212102	CD, 1000pF, ±10%
CC20	24212102	CD, 1000pF, ±10%
CC21	24212471	CD, 470pF, ±10%
CG60	24794470	EL, 47μF, ±20% (2173DD)
CG61	24794101	EL, 100μF, ±20% (2173DD)
CG62	24232103	CD, 0.01μF, +80%, -20% (2173DD)
CG63	24085944	EL, 2.2μF (2173DD)
CG64	24085944	EL, 2.2μF (2173DD)
CG65	24085958	EL, 1μF (2173DD)
CG66	24085958	EL, 1μF (2173DD)
CG67	24590822	PF, 8200pF (2173DD)
CG68	24590822	PF, 8200pF (2173DD)
CG69	24590123	PF, 0.012μF (2173DD)
CG70	24590123	PF, 0.012μF (2173DD)
CG71	24232103	CD, 0.01μF, +80%, -20% (2173DD)
CG72	24232103	CD, 0.01μF, ±80%, -20% (2173DD)
CG73	24203100	EL, 10μF, ±20% (2173DD)
CG74	24212102	CD, 1000pF, ±10% (2173DD)
CQ02	24797010	EL, 1μF, ±20%, 50V
CR01	24797010	EL, 1μF, ±20%, 50V
CR02	24797010	EL, 1μF, ±20%, 50V
CR03	24797010	EL, 1μF, ±20%, 50V
CR04	24203100	EL, 10μF, ±20%, 16V
CR05	24203100	EL, 10μF, ±20%, 16V
CS01	24085946	EL, 10μF, ±20%, 16V, Non-Polar
CS02	24085944	EL, 2.2μF, ±20%, 50V, Non-Polar
CS03	24085944	EL, 2.2μF, ±20%, 50V, Non-Polar
CS04	24206010	EL, 1μF, 50V
CS05	24206010	EL, 1μF, 50V
CS06	24206010	EL, 1μF, 50V
CS07	24206010	EL, 1μF, 50V
CS10	24203100	EL, 10μF, ±20%, 16V
CS11	24203100	EL, 10μF, ±20%, 16V
CS16	24474102	CD, 1000pF, ±10%
CS17	24474102	CD, 1000pF, ±10%
CS18	24474102	CD, 1000pF, ±10%
CS19	24474102	CD, 1000pF, ±10%

Location No.	Part No.	Description
CV04	24763471	EL, 470μF, ±20%, 16V
CV06	24794221	EL, 220μF, ±20%, 16V
CV07	24763471	EL, 470μF, ±20%, 16V
CV20	24203100	EL, 10μF, ±20%, 16V
CV21	24203101	EL, 100μF, ±20%, 16V
CV22	24203100	EL, 10μF, ±20%, 16V
CV24	24232103	CD, 0.01μF, +80%, −20%
CV33	24232103	CD, 0.01μF, +80%, −20%
RESISTORS		
R101	24382183	OMF, 18k ohm, 1W
R210	24366271	CF, 270 ohm
R211	24366271	CF, 270 ohm
R212	24366271	CF, 270 ohm
R213	24366223	CF, 22k ohm
R214	24366824	CF, 820k ohm
R218	24366623	CF, 62k ohm
R220	24366103	CF, 10k ohm
R221	24366102	CF, 1k ohm
R228	24366473	CF, 47k ohm
R230	24366103	CF, 10k ohm
R231	24366472	CF, 4700 ohm
R301	24366332	CF, 3300 ohm
R303	24321109	MF, 1 ohm, 1/2W
R304	24366473	CF, 47k ohm
R305	24322159	OMF, 1.5 ohm, 1W
R306	24366393	CF, 39k ohm
R307	24366913	CF, 91k ohm
R308	24366102	CF, 1k ohm
R310	24552822	OMF, 8200 ohm, 1/2W
R313	24366183	CF, 18k ohm
R327	24000577	FR, 5.6 ohm, 1W
R336	24383221	OMF, 220 ohm, 2W
R341	24366102	CF, 1k ohm
R342	24366562	CF, 5600 ohm
R343	24310159	MF, 1.5 ohm, 1/2W
R344	24366392	CF, 3900 ohm
R346	24366153	CF, 15k ohm
R401	24366104	CF, 100k ohm
R402	24366103	CF, 10k ohm
R403	24366472	CF, 4700 ohm
R405	24366104	CF, 100k ohm
R410	24366151	CF, 150 ohm
R411	24366561	CF, 560 ohm
R412	24552560	OMF, 56 ohm, 1/2W
R415	24382103	OMF, 10k ohm, 1W
R416	24019321	OMF, 1500 ohm, 5W
R421	24546129	FR, 1.2 ohm, 1/2W
R422	24366221	CF, 220 ohm
R430	24366103	CF, 10k ohm
R432	24531560	FR, 56 ohm, 1/2W
R434	24552121	OMF, 120 ohm, 1/2W
R435	24366391	CF, 390 ohm
R436	24366561	CF, 560 ohm
R437	24366392	CF, 3900 ohm
R441	24532102	FR, 1k ohm, 1W
R447	24382472	OMF, 4700 ohm, 1W
R448	24338278	OMF, 0.27 ohm, 1W
R470	24338688	MF, 0.68 ohm, 1W
R471	24552820	OMF, 82 ohm, 1/2W
R479	24552820	OMF, 82 ohm, 1/2W
R501	24366273	CF, 27k ohm
R509	24366391	CF, 390 ohm
R510	24366391	CF, 390 ohm

Location No.	Part No.	Description
R610	24366563	CF, 56k ohm
R612	24366103	CF, 10k ohm
R643	24552331	OMF, 330 ohm, 1/2W
R644	24552331	OMF, 330 ohm, 1/2W
R661	24366222	CF, 2200 ohm (2173DF)
R661	243666882	CF, 6800 ohm (2173DD)
R662	24366222	CF, 2200 ohm (2173DF)
R662	243666882	CF, 6800 ohm (2173DD)
R663	24366272	CF, 2700 ohm (2173DF)
R663	24366222	CF, 2200 ohm (2173DD)
R664	24366272	CF, 2700 ohm (2173DF)
R664	24366222	CF, 2200 ohm (2173DD)
R667	24366104	CF, 100k ohm
R668	24366103	CF, 10k ohm
R669	24366103	CF, 10k ohm
R676	24366229	CF, 2.2 ohm
R677	24366229	CF, 2.2 ohm
⚠R801	24009954	Metal-Glazed Resistor, 2.2M ohm, 1/2W
⚠R808	24019340	PTC Thermistor, 18 ohm, 290V
R810	24568229	Cement, 2.2 ohm, 7W
R830	24323279	MF, 2.7 ohm, 2W (2173DF)
R830	24323339	MF, 3.3 ohm, 2W (2173DD)
R831	24366331	CF, 330 ohm
R832	24383270	OMF, 27 ohm, 2W (2173DF)
R840	24531120	FR, 12 ohm, 1/2W
R842	24552472	OMF, 4700 ohm, 1/2W
R847	24366472	CF, 4700 ohm
R861	24382563	OMF, 56k ohm, 1W
R862	24381220	OMF, 22 ohm, 1/2W
R864	24366102	CF, 1k ohm
R866	24381390	OMF, 39 ohm, 1/2W
R868	24552103	OMF, 10k ohm, 1/2W
R870	24381820	OMF, 82 ohm, 1/2W
R871	24310109	MF, 1.0 ohm, 1/2W
R883	24552752	OMF, 7500 ohm, 1/2W
R884	24552752	OMF, 7500 ohm, 1/2W
R890	24381333	OMF, 33k ohm, 1/2W
R891	24366102	CF, 1k ohm
⚠R899	24005007	Metal-Glazed Resistor, 8.2M ohm, 1W
R901	24376472	CF, 4700 ohm, 1/2W
R902	24376472	CF, 4700 ohm, 1/2W
R903	24376472	CF, 4700 ohm, 1/2W
R911	24366101	CF, 100 ohm
R912	24366101	CF, 100 ohm
R913	24366101	CF, 100 ohm
R920	24000568	FR, 4.7 ohm, 1W
R921	24366471	CF, 470 ohm
R922	24366471	CF, 470 ohm
R923	24366471	CF, 470 ohm
R931	24366102	CF, 1k ohm
R932	24366102	CF, 1k ohm
R933	24366102	CF, 1k ohm
R961	24554183	OMF, 18k ohm, 2W
R962	24554183	OMF, 18k ohm, 2W
R963	24554183	OMF, 18k ohm, 2W
R971	24366272	CF, 2700 ohm
R972	24366821	CF, 820 ohm
R973	24366681	CF, 680 ohm
R974	24366102	CF, 1k ohm
R980	24383220	OMF, 22 ohm, 2W
RA02	24366472	CF, 4700 ohm

Location No.	Part No.	Description
RA03	24366472	CF, 4700 ohm
RA07	24366473	CF, 47k ohm
RA08	24366102	CF, 1k ohm
RA09	24366102	CF, 1k ohm
RA10	24366102	CF, 1k ohm
RA101	24366102	CF, 1k ohm
RA11	24366102	CF, 1k ohm
RA12	24366102	CF, 1k ohm
RA14	24366472	CF, 4700 ohm
RA16	24366472	CF, 4700 ohm
RA26	24366273	CF, 27k ohm
RA27	24366102	CF, 1k ohm
RA30	24366182	CF, 1800 ohm
RA31	24366102	CF, 1k ohm
RA32	24366122	CF, 1200 ohm
RA33	24366122	CF, 1200 ohm
RA34	24366122	CF, 1200 ohm
RA35	24366102	CF, 1k ohm
RA36	24366102	CF, 1k ohm
RA37	24366102	CF, 1k ohm
RA43	24366102	CF, 1k ohm
RA44	24366103	CF, 10k ohm
RA45	24366102	CF, 1k ohm
RA47	24366473	CF, 47k ohm
RA48	24366102	CF, 1k ohm
RA49	24366331	CF, 330 ohm
RA50	24366331	CF, 330 ohm
RA51	24366101	CF, 100 ohm
RA52	24366101	CF, 100 ohm
RA61	24366472	CF, 4700 ohm
RA62	24366472	CF, 4700 ohm
RA64	24366470	CF, 47 ohm
RA68	24366472	CF, 4700 ohm
RA69	24366472	CF, 4700 ohm
RA70	24366103	CF, 10k ohm
RA71	24366222	CF, 2200 ohm
RA75	24366103	CF, 10k ohm
RA77	24366102	CF, 1k ohm
RA84	24366102	CF, 1k ohm
RA86	24366331	CF, 330 ohm
RA94	24366102	CF, 1k ohm
RA97	24366332	CF, 3300 ohm
RA98	24366682	CF, 6800 ohm
RA99	24366203	CF, 20k ohm
RB01	24366271	CF, 270 ohm
RB09	24366470	CF, 47 ohm
RB10	24366182	CF, 1800 ohm
RB11	24366471	CF, 470 ohm
RB12	24366333	CF, 33k ohm
RB13	24366564	CF, 560k ohm
RB14	24366123	CF, 12k ohm
RB15	24366392	CF, 3900 ohm
RB16	24366392	CF, 3900 ohm
RB19	24366223	CF, 22k ohm
RB20	24366823	CF, 82k ohm
RB22	24366103	CF, 10k ohm
RB26	24366103	CF, 10k ohm
RB27	24366103	CF, 10k ohm
RB28	24366104	CF, 100k ohm
RB30	24366103	CF, 10k ohm
RB51	24366101	CF, 100 ohm
RB52	24366101	CF, 100 ohm
RB93	24366103	CF, 10k ohm
RC01	24531100	FR, 10 ohm, 1/2W

Location No.	Part No.	Description
RG60	24366472	CF, 4700 ohm (2173DD)
RG61	24366472	CF, 4700 ohm (2173DD)
RG62	24366392	CF, 3900 ohm (2173DD)
RG63	24366392	CF, 3900 ohm (2173DD)
RG64	24366101	CF, 100 ohm (2173DD)
RG65	24366101	CF, 100 ohm (2173DD)
RG66	24366101	CF, 100 ohm (2173DD)
RG67	24366101	CF, 100 ohm (2173DD)
RG68	24366104	CF, 100k ohm (2173DD)
RR01	24366101	CF, 100 ohm
RR02	24366101	CF, 100 ohm
RR03	24366101	CF, 100 ohm
RR04	24366472	CF, 4700 ohm
RR05	24366391	CF, 390 ohm
RR06	24366564	CF, 560k ohm
RR07	24366564	CF, 560k ohm
RR08	24366564	CF, 560k ohm
RR09	24366221	CF, 220 ohm
RR12	24366102	CF, 1k ohm
RR16	24366220	CF, 22 ohm
RR17	24366220	CF, 22 ohm
RR18	24366220	CF, 22 ohm
RR20	24366103	CF, 10k ohm
RR21	24366103	CF, 10k ohm
RR22	24366222	CF, 2200 ohm
RR23	24366473	CF, 47k ohm
RR24	24366560	CF, 56 ohm
RR25	24366472	CF, 4700 ohm
RR26	24366560	CF, 56 ohm
RR27	24366102	CF, 1k ohm
RR28	24366560	CF, 56 ohm
RR29	24366750	CF, 75 ohm
RR30	24366472	CF, 4700 ohm
RR31	24366472	CF, 4700 ohm
RR32	24366472	CF, 4700 ohm
RR33	24366123	CF, 12k ohm
RS01	24366104	CF, 100k ohm
RS02	24366681	CF, 680 ohm
RS03	24366104	CF, 100k ohm
RS04	24366681	CF, 680 ohm
RS05	24366103	CF, 10k ohm
RS06	24366103	CF, 10k ohm
RS10	24366223	CF, 22k ohm
RS11	24366223	CF, 22k ohm
RS12	24366223	CF, 22k ohm
RS13	24366223	CF, 22k ohm
RS14	24366101	CF, 100 ohm
RS15	24366101	CF, 100 ohm
RS17	24366472	CF, 4700 ohm
RS18	24366472	CF, 4700 ohm
RS19	24366101	CF, 100 ohm
RS20	24366222	CF, 2200 ohm
RS21	24366101	CF, 100 ohm
RS22	24366222	CF, 2200 ohm
RT36	24366331	CF, 330 ohm
RT37	24366331	CF, 330 ohm
RT38	24366331	CF, 330 ohm
RV04	24366750	CF, 75 ohm
RV05	24366750	CF, 75 ohm
RV06	24366750	CF, 75 ohm
RV07	24366750	CF, 75 ohm
RV10	24366101	CF, 100 ohm
RV11	24366472	CF, 4700 ohm
RV12	24366101	CF, 100 ohm

Location No.	Part No.	Description
RV13	24366472	CF, 4700 ohm
RV14	24366101	CF, 100 ohm
RV19	24366151	CF, 150 ohm
RV20	24366123	CF, 12k ohm
RV22	24366123	CF, 12k ohm
RV24	24366102	CF, 1k ohm
RV25	24366102	CF, 1k ohm
RV30	24366271	CF, 270 ohm
RV31	24366101	CF, 100 ohm
RV32	24366271	CF, 270 ohm
RV33	24366101	CF, 100 ohm
RV37	24366151	CF, 150 ohm
RV38	24366822	CF, 8200 ohm
RV39	24366822	CF, 8200 ohm
RV60	24366183	CF, 18k ohm
RV83	24366332	CF, 3300 ohm
RV84	24366102	CF, 1k ohm
RV85	24366102	CF, 1k ohm
RV87	24366332	CF, 3300 ohm
RV88	24366102	CF, 1k ohm
RV89	24366102	CF, 1k ohm
RV90	24366101	CF, 100 ohm
RV91	24366101	CF, 100 ohm
COILS & TRANSFORMERS		
L211	23289101	Coil, Peaking, TRF4101AF
L301	23103859	Coil (Ferrite Bead), TEM2011
L302	23289330	Coil, Peaking, TRF4330AF
L430	23289470	Coil, Peaking, TRF4470AF
L431	23289100	Coil, Peaking, TRF4100AF
L441	23233070	Coil, Linearity, TLN2111G
L462	----------	DY, Supplied with V901.
L503	23289100	Coil, Peaking, TRF4100AF
L505	23289100	Coil, Peaking, TRF4100AF
L805	23248150	Coil, Choke, TLN3427
L806	23248150	Coil, Choke, TLN3427
L861	23103859	Coil (Ferrite Bead), TEM2011
L862	23103937	Coil (Ferrite Bead), TEM2004
L883	23103859	Coil (Ferrite Bead), TEM2011
L884	23103859	Coil (Ferrite Bead), TEM2011
L885	23248073	Coil, Choke, TLN3299D
L886	23103859	Coil (Ferrite Bead), TEM2011
L887	23280016	Coil, Peaking, TRF4100AZ
L888	23103859	Coil (Ferrite Bead), TEM2011
⚠L901	23200205	Coil, Degaussing, TSB-2333AR
LA38	23103941	Coil (Ferrite Bead), TEM2000
LA39	23103941	Coil (Ferrite Bead), TEM2000
LA44	23103941	Coil (Ferrite Bead), TEM2000
LA45	23289109	Coil, Peaking, TRF41R0AF
LC10	23238562	Coil, Peaking, TRF4109AJ
LC11	23103941	Coil (Ferrite Bead), TEM2000
LC12	23238562	Coil, Peaking, TRF4109AJ
LC13	23238562	Coil, Peaking, TRF4109AJ
LC14	23303181	Filter, TEM1012N
LC15	23303181	Filter, TEM1012N
LC16	23303181	Filter, TEM1012N
LC17	23303181	Filter, TEM1012N
T401	23224983	Transformer, Horiz. Drive, TLN1039
⚠T461	23236510	Transformer, Flyback, TFB4123BE
⚠T801	23211699	Line Filter, TRF3219AM
⚠T862	23217346	Transformer, TPW3365AR

Location No.	Part No.	Description
SEMICONDUCTORS		
IC301	B0377890	IC, TA8403K
IC610	B0376856	IC, TA8211AH
IC840	23318299	IC, L78MR05
ICR01	B0487584	IC, TC74HC4053AP
Q304	A6002020	Transistor, RN1202
Q340	A6534053	Transistor, 2SA1015-Y(TE
Q402	A6330069	Transistor, 2SC2482 FA-1
Q404	23314375	Transistor, ON4409(508D)
Q421	23314141	Transistor, 2SC3852
Q430	23314141	Transistor, 2SC3852
Q431	A6317440	Transistor, 2SC1815-Y
Q501	B0101543	IC, TB1226AN (2173DF)
Q501	23905779	IC, TB1229AN (2173DD)
Q608	A6342206	Transistor, 2SC2878-A(TE
Q609	A6342206	Transistor, 2SC2878-A(TE
Q612	A6534053	Transistor, 2SA1015-Y(TE
Q801	23906039	IC, STR-Z2154B
Q830	23314141	Transistor, 2SC3852
⚠Q862	A8643108	Photo Coupler, TLP621(GR-LF
Q872	23314141	Transistor, 2SC3852
Q901	A6330059	Transistor, 2SC2482(C)
Q902	A6330059	Transistor, 2SC2482(C)
Q903	A6330059	Transistor, 2SC2482(C)
Q971	A6534053	Transistor, 2SA1015-Y(TE
Q980	A6330059	Transistor, 2SC2482(C)
QA01	23906055	IC, SAA5297A/013
QA02	23904968	IC, XL24C04P
QB02	A6002010	Transistor, RN1201
QB03	A6002010	Transistor, RN1201
QB11	A6317440	Transistor, 2SC1815-Y
QB12	A6534053	Transistor, 2SA1015-Y(TE
QB20	A6002010	Transistor, RN1201
QB21	A6317440	Transistor, 2SC1815-Y
QB30	A6317440	Transistor, 2SC1815-Y
QB43	A6317440	Transistor, 2SC1815-Y
QG60	23905560	IC, M62420SP (2173DD)
QR07	A6534053	Transistor, 2SA1015-Y(TE
QR08	A6534053	Transistor, 2SA1015-Y(TE
QR09	A6534053	Transistor, 2SA1015-Y(TE
QR10	A6734590	Transistor, 2SC752(G)TM-Y
QR11	A6317440	Transistor, 2SC1815-Y
QR12	A6317440	Transistor, 2SC1815-Y
QR13	A6734590	Transistor, 2SC752(G)TM-Y
QR14	A6317440	Transistor, 2SC1815-Y
QR15	A6317440	Transistor, 2SC1815-Y
QS01	A6342206	Transistor, 2SC2878-A(TE
QS02	A6342206	Transistor, 2SC2878-A(TE
QS03	A6317440	Transistor, 2SC1815-Y
QS04	A6317440	Transistor, 2SC1815-Y
QV01	23904747	IC, MM1250XD
QV07	A6534053	Transistor, 2SA1015-Y(TE
QV08	A6534053	Transistor, 2SA1015-Y(TE
QV13	A6534053	Transistor, 2SA1015-Y(TE
QV14	A6534053	Transistor, 2SA1015-Y(TE
QV20	A6317440	Transistor, 2SC1815-Y
D101	23115878	Diode, Zener, μPC574J, (L)
D201	23316686	Diode, Zener, MTZJ9.1A
D202	23316686	Diode, Zener, MTZJ9.1A
D203	23316686	Diode, Zener, MTZJ9.1A
D204	23115599	Diode, 1N4148
D230	23115599	Diode, 1N4148
D240	23115599	Diode, 1N4148
D301	23118479	Diode, BYD33J

Location No.	Part No.	Description
D303	23316794	Diode, SC570A
D308	23118479	Diode, BYD33J
D340	23316650	Diode, Zener, MTZJ2.4A
D401	23316684	Diode, Zener, MTZJ8.2B
D403	23316667	Diode, Zener, MTZJ4.7C
D406	23118479	Diode, BYD33J
D408	A7580658	Diode, 3JH41
D421	23316668	Diode, Zener, MTZJ5.1A
D422	23316666	Diode, Zener, MTZJ4.7B
D431	23316683	Diode, Zener, MTZJ8.2A
D440	23316254	Diode, ERC06-15
D441	23316688	Diode, Zener, MTZJ9.1C
D461	23118338	Diode, RU4AM
D610	23115599	Diode, 1N4148
D612	23115599	Diode, 1N4148
D615	23115599	Diode, 1N4148
D616	23115599	Diode, 1N4148
D617	23115599	Diode, 1N4148
D618	23115599	Diode, 1N4148
D619	23115599	Diode, 1N4148
D830	23316672	Diode, Zener, MTZJ5.6B
D845	23316686	Diode, Zener, MTZJ9.1A
D862	23118094	Diode, EU2A
D864	23118094	Diode, EU2A
D872	23316726	Diode, Zener, MTZJ15C
D875	23316719	Diode, Zener, MTZJ12B
D876	23115599	Diode, 1N4148
D878	23316747	Diode, Zener, MTZJ27C
D880	23115599	Diode, 1N4148
D883	23316813	Diode, EG1
D884	23316813	Diode, EG1
D885	23316766	Diode, RU2YX
D886	23316766	Diode, RU2YX
D903	23115599	Diode, 1N4148
D904	23115599	Diode, 1N4148
D980	23115599	Diode, 1N4148
D981	23316554	Diode, 1SS146
D982	23316554	Diode, 1SS146
D983	23316554	Diode, 1SS146
DA10	23115599	Diode, 1N4148
DA11	23115599	Diode, 1N4148
DA12	23115599	Diode, 1N4148
DA16	23115599	Diode, 1N4148
DA32	23115599	Diode, 1N4148
DA33	23115599	Diode, 1N4148
DA34	23115599	Diode, 1N4148
DA44	23316675	Diode, Zener, MTZJ6.2B
DB01	23358504	LED, Red, SCL003URC3FX
DB30	23316673	Diode, Zener, MTZJ5.6C
DR01	23115599	Diode, 1N4148
DR02	23115599	Diode, 1N4148
DR03	23115599	Diode, 1N4148
DR04	23115599	Diode, 1N4148
DR06	23115599	Diode, 1N4148

MISCELLANEOUS

B202	23861590	Frame, Terminal
⚠F470	23144501	Fuse, 0.8A
F470A	23165433	Holder, Fuse
⚠F801	23144507	Fuse, 3.15A
F801A	23165433	Holder, Fuse
G101	23289101	Coil, Peaking, TRF4101AF
G105	23238714	Coil, Peaking, TRF4100AJ
G106	23103859	Ferrite Choke, TEM2011

Location No.	Part No.	Description
G107	23238714	Coil, Peaking, TRF4100AJ
G410	23103859	Ferrite Choke, TEM2011
G501	23289100	Coil, Peaking, TRF4100AF
G616	24366102	CF, 1k ohm
GS03	24366681	CF, 680 ohm
GS06	24366681	CF, 680 ohm
GS08	24366681	CF, 680 ohm
GS09	24366681	CF, 680 ohm
GS10	23289109	Coil, Peaking, TRF41R0AF
GS44	24366681	CF, 680 ohm
GS45	24366681	CF, 680 ohm
H002	23148276	Module, MVGS49, IF FR MPX APRO (2173DF)
H002	23148250	Module, MVGS44A, IF MPXAPRO (2173DD)
KB01	23904946	Remote Sensor, RPM-676CBR-S
P661	23363607	Headphone Jack, 3.5mm
P801	23372014	Power Cord
PH01	23365598	Connector, 21Pin
PH02	23365598	Connector, 21Pin
PV02	23363252	Pin Jack, Yellow
PV03	23365508	Jack, Phono
⚠S801	23344395	Switch, Power
SA01	23145430	Switch, Push, 1C1P
SA02	23145430	Switch, Push, 1C1P
SA03	23145430	Switch, Push, 1C1P
SA04	23145430	Switch, Push, 1C1P
SA05	23145430	Switch, Push, 1C1P
⚠V901A	23902891	Socket, CRT, 10P
W661	23351116	Speaker, SPK-1382, 60x120mm, 8 ohm
W662	23351116	Speaker, SPK-1382, 60x120mm, 8 ohm
X501	23153438	Crystal, 16.2
XA01	23153930	Crystal, 12.0MHz
⚠Z801	23904997	IC, HIC1015
⚠Z830	23144536	Protector, PRF10005491, 125V, 1A
⚠Z860	23144539	Protector, PRF20005491, 125V, 2A

PC BOARD ASSEMBLIES

✻U901	23706404	CRT Drive Board, PB7140X
✻U902A	23706587	Main Board, PB7124C(2173DF)
✻U902A	23706928	Main Board, PB7124B(2173DD)
✻U903	23706451	A. PRO Board PB7167 (2173DD)

PICTURE TUBE

⚠V901	23312670	Picture Tube, A51EAL155X01

TUNER

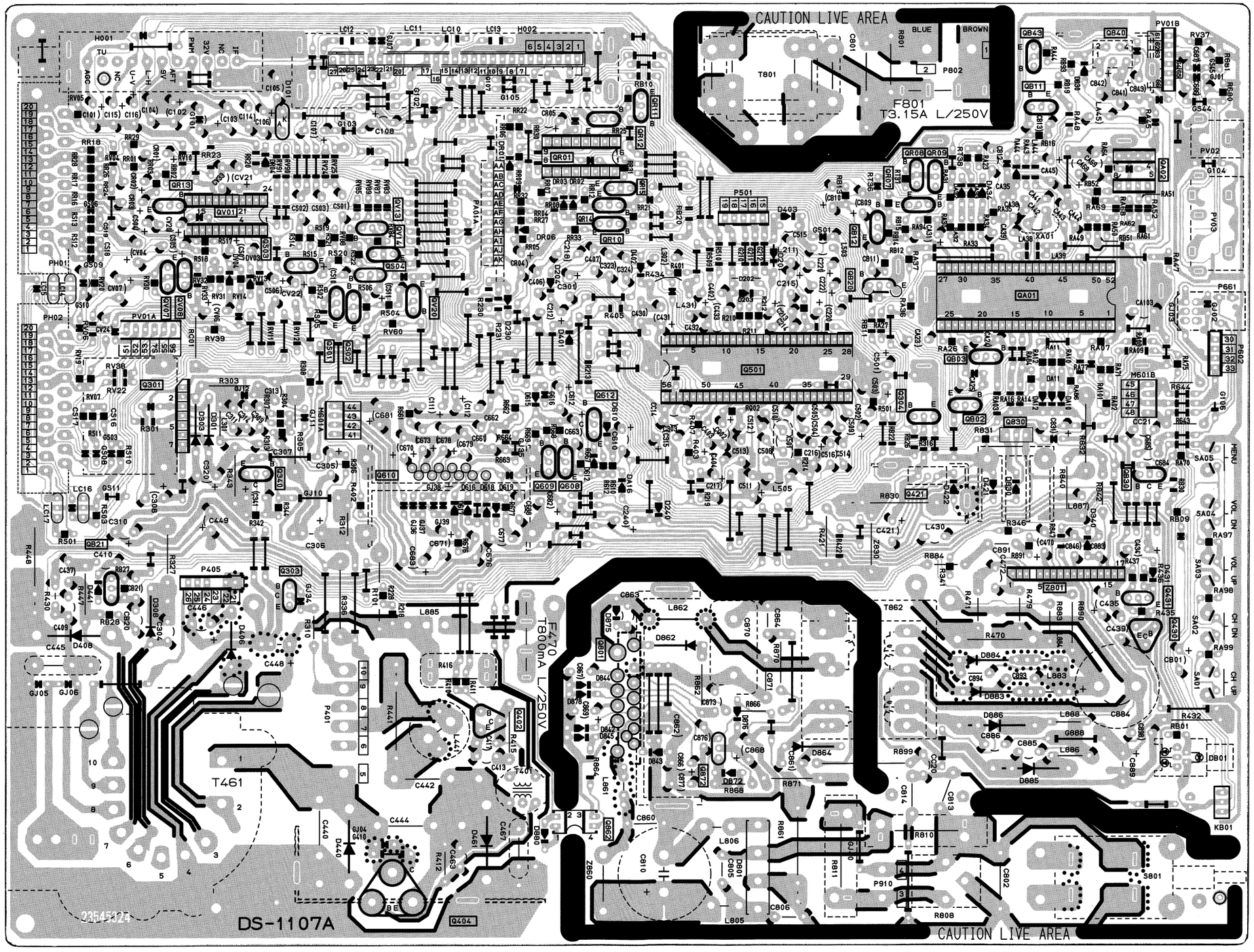
H001	23321159	Tuner, EGA11

ACCESSORIES

K902	23306168	Remote Hand Unit, CT-9859
Y101	23562698	Owner's Manual, English/French, 2173DF
Y102	23563122	Owner's Manual, 2173DF/DD
Y103	23563123	Owner's Manual, 2173DF/DD

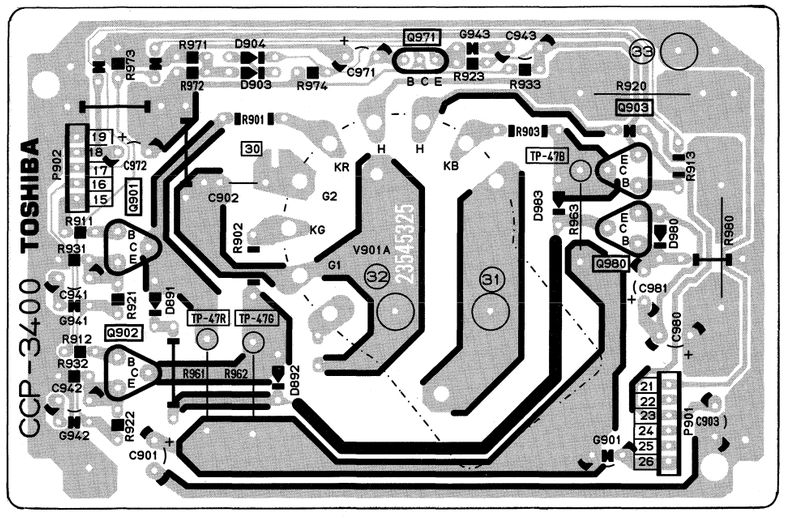
MAIN BOARD PB7124B/C

BOTTOM (FOIL) SIDE



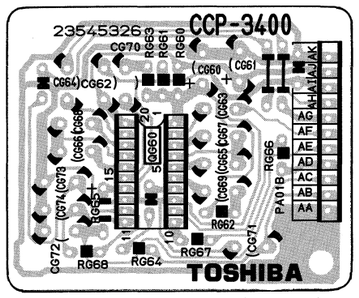
CRT DRIVE BOARD PB7140X

BOTTOM (FOIL) SIDE



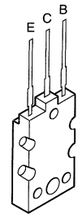
A. PRO BOARD PB7167 (2173DD)

BOTTOM (FOIL) SIDE

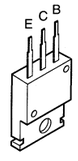


TERMINAL VIEW OF TRANSISTORS

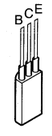
① 2SD2253



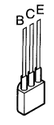
② 2SC3852
2SD1763A
2SC1569
2SC4544
2SA1788
2SA1306
2SA1186A



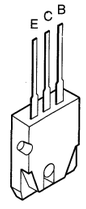
③ 2SC752GTM
2SC2482
2SC2655
2SC4721P



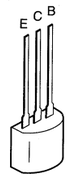
④ 2SC752
2SA562TM
2SA1015
2SC1815
2SC2878
2SC1740S
2SC2120
2SA9335



⑤ 2SA1788



⑥ RN2203
RN2201
RN2004
RN1203
RN1204
RN2204
RN1205
RN1202
RN1201



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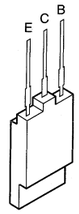
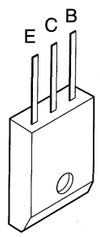


⑧ ON4409



SCHEMATIC DIAGRAM MODEL : 2173DF / 2173DD

CAUTION: The international hazard symbols "⚠" in the schematic diagram and the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list. The mounting position of replacements is to be identical with originals. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE on page 3. Do not degrade the safety of the receiver through improper servicing.

OBSERVATION OF VOLTAGES AND WAVEFORMS

1. Voltages read with VTVM from point shown to chassis ground, line voltage 220 volts, colour bar signal. Voltages reading may vary ±20%.
2. All waveforms are taken using a wide band oscilloscope and a low capacity probe.
3. Waveforms are taken using a standard colour bar signal.
4. Make sure that CONTRAST and COLOUR controls are in mid position and BRIGHTNESS control is almost in maximum position. Set other controls for best picture.

NOTES:

1. D.C. resistance value of a principal
   gram. These are measured for separa
2. The circuits are subject to change wi
3. ⬬ : Solder links.

U903 APRO. PB7167

DD.DS : USED
DB.DF.DN:NOT USE

U902A MAIN BOARD PB7124

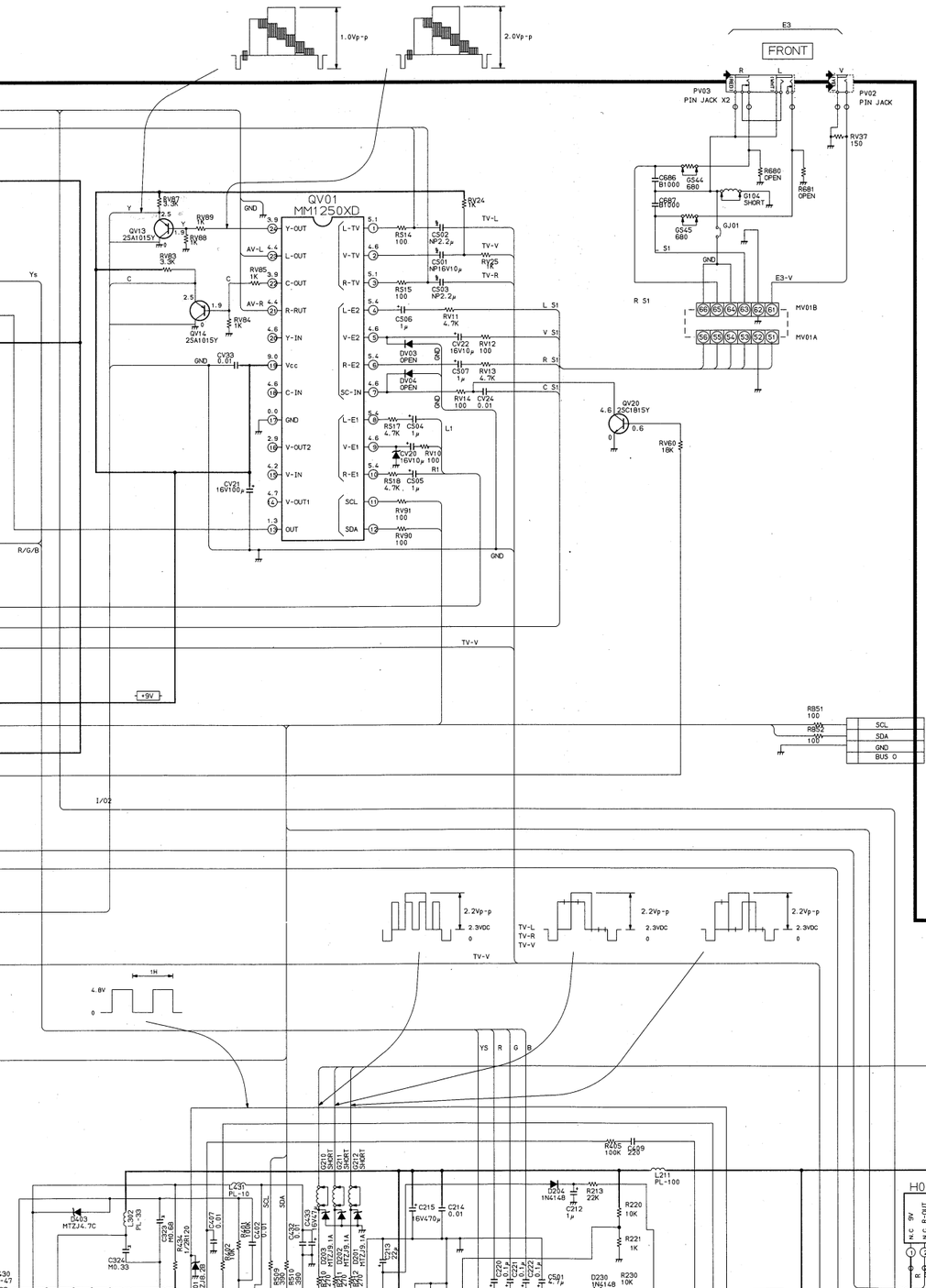
NOTES:

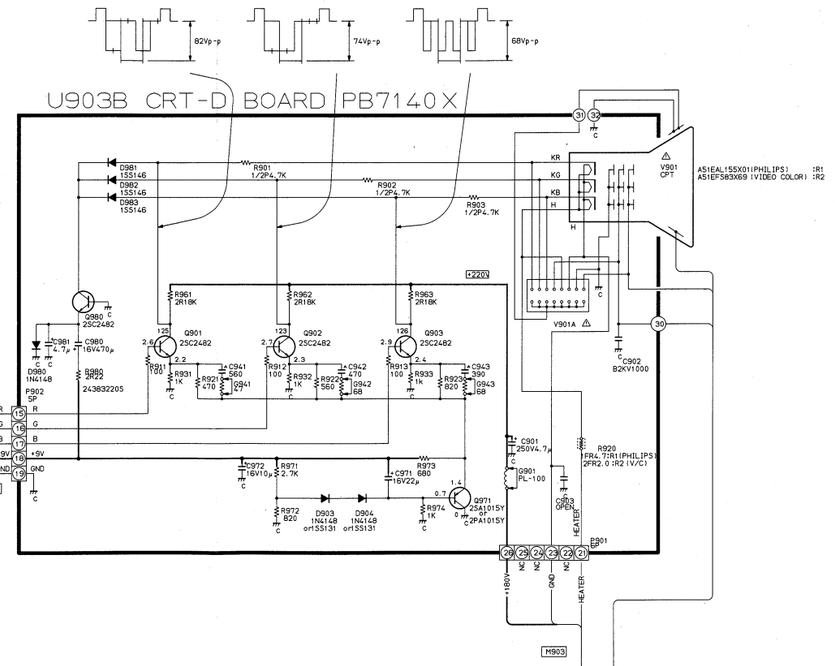
1. D.C. resistance value of a principal transformer is shown in this schematic diagram. These are measured for separated from the circuit.
2. The circuits are subject to change without notice.
3. ⬬ : Solder links.

EXPRESSION

VALUE OF RESISTOR, CAPACITOR and INDUCTOR

1. Resistance is shown in ohm, k=1,000, M=1,000,000
2. Unless other wise noted in schematic, all capacitor values less than 1 are expressed in μF and the values more than 1 in pF.
3. Unless otherwise noted in schematic, all inductor values more than 1 are expressed in μH, and the values less than 1 in H.





NOTE

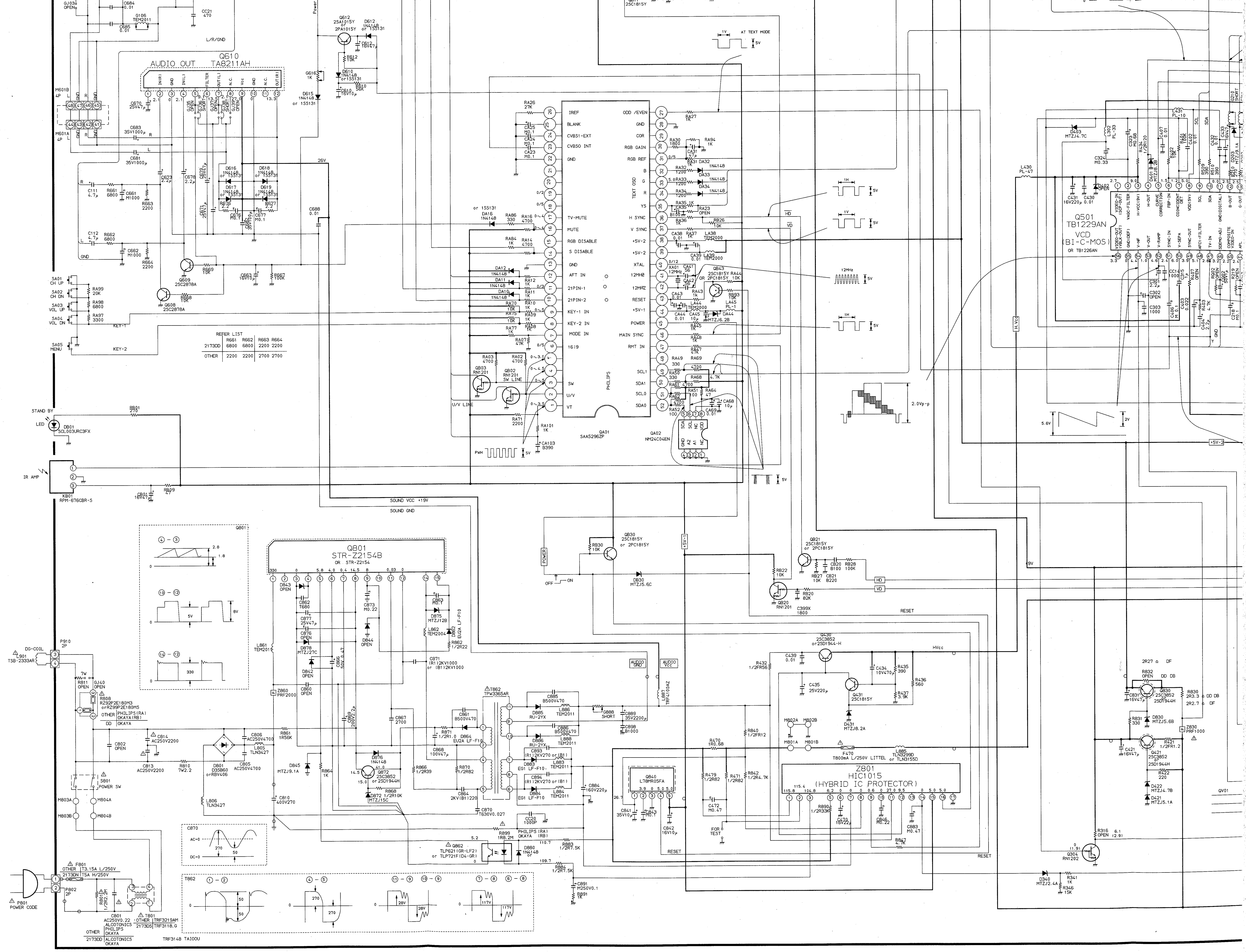
The marking [OPEN] means that there are on component on the PCB though there are the marking of part No. on the PCB. Its means open circulted.

LIST OF DIFFERENCE OF EACH C.P.T.

	R1	R2
V901	A51EAL155X01 (PHILIPS)	A51EFS83X69 (VIDEO COLOUR)
C444	1.5kV3600pF	1.5kV3300pF
R307	91kΩ	82kΩ
R312	OPEN	1/2R3.9kΩ
R313	18kΩ	16kΩ
R920	1FR4.7Ω	2FR2.0Ω
C442	250V0.39μF	250V0.43μF
C440	1.5KV5600pF	1.5KV5400pF

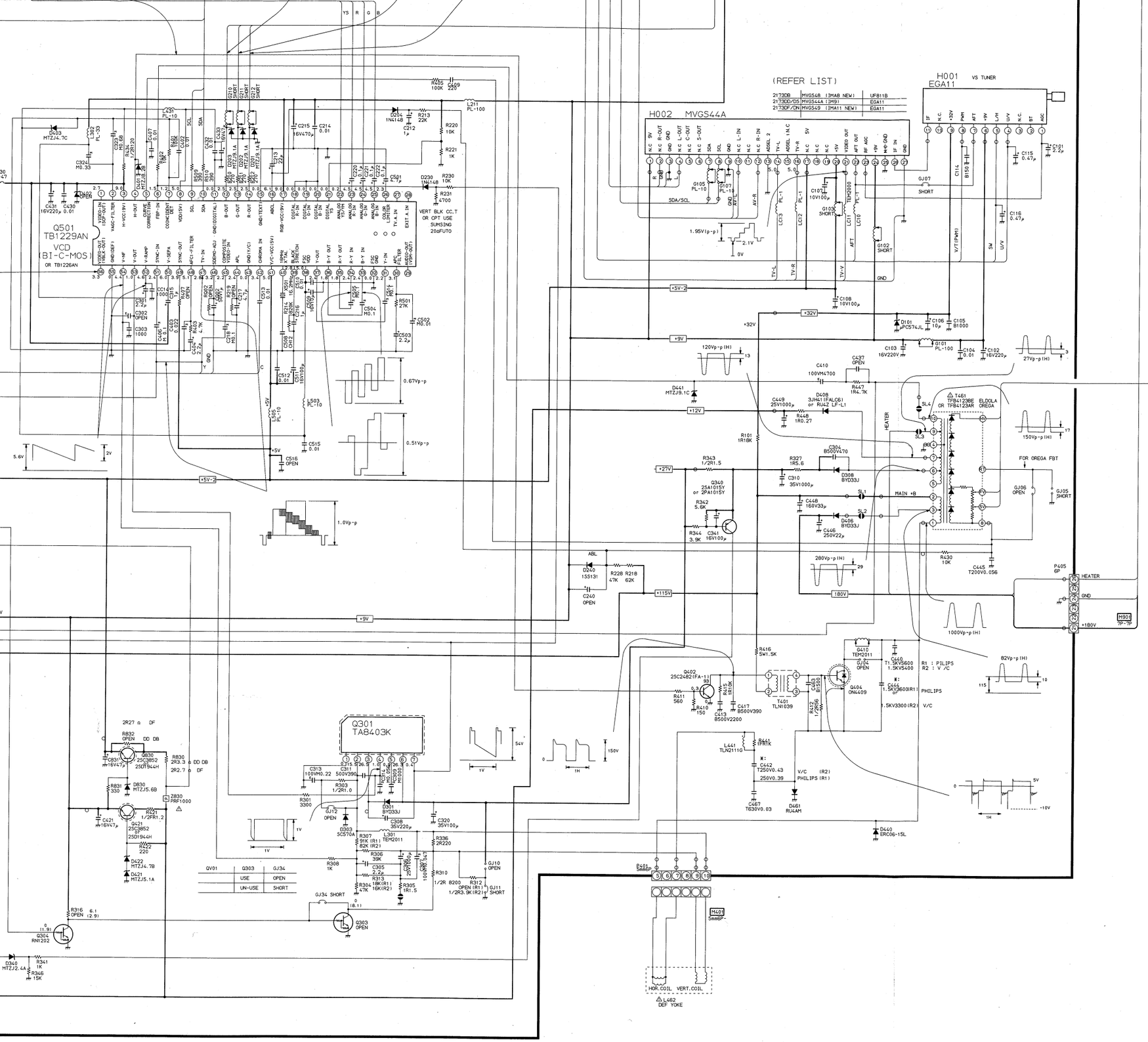
LIST OF DIFFERENCE FOR EACH MODELS

	2173DF	2173DB	2173DD	2173DN	2173DS
sub data / OPT	DAH	A9H	DDH	DBH	
CB11	68 PF	180 PF	180 PF	180 PF	180 PF
H001	TN-EGA11 (IN7)	TN-UFB11B (IN8)	TN-EGA11 (IN7)	←	←
H002	MVGS49 (IMA11)	MVGS48 (IMA8)	MVGS44A (IM9)	MVGS48 (IMA11)	MVGS44A (IM9)


AUDIO OUT Q610 TA8211AH
M601B 4P
M601A 4P
SA01 CH UP
SA02 CH DN
SA03 VOL UP
SA04 VOL DN
SA05 MENU
KEY-1
KEY-2
Q609 2SC2878A
Q608 2SC2878A
STAND BY
LED
DB01 SCL003URC3FX
IR AMP
KB01 RPM-676CBR-S
Q612 2SA1015Y or 2PA1015Y
SOUND VCC +19V
SOUND GND
QA01 SAA5296ZP
QA02 NM24C04EN
PHILIPS
TEXT OSD
IREF
BLANK
CVBS1-EXT
CVBS0 INT
GND
TV-MUTE
MUTE
RGB DISABLE
S DISABLE
AFT IN
21PIN-1
21PIN-2
KEY-1 IN
KEY-2 IN
MODE IN
16:9
SW
U/V
VT
ODD /EVEN
COR
RGB GAIN
RGB REF
B
G
R
YS
H SYNC
V SYNC
+5V-2
XTAL
12MHZ
RESET
+5V-1
POWER
MAIN SYNC
RMT IN
SCL1
SDA1
SCL0
SDA0
QB03 RN1201
QB02 RN1201 SW LINE
U/V LINE
PWH
AT TEXT MODE
12MHz
2.0Vp-p
Q501 TB1229AN
VCD (BI-C-MOS)
OR TB1226AN
VIDEO-IN (SCP-OUT)
VAGC-FILTER
H-VCC(9V)
H-OUT
CURVE CORRECTION
FBP-IN
COINCIDENT DET
VDD(5V)
SCL
SDA
GND(DIGITAL)
B-OUT
G-OUT
VIDEO-OUT (VBLK-OUT)
GND(DEF)
V-NF
V-OUT
V-RAMP
SYNC-IN
V-SEPA
SYNC-OUT
AFC1-FILTER
TV-IN
SDEMO-ADJ
COMPOSITE VIDEO-IN
APL
H.Vcc
+5V-2
Q801 STR-Z2154B
OR STR-Z2154
T862 TPW3365AR
Q872 2SC3852 or 2SD1944H
Q862 TLP621(GR-LF2) or TLP721F(D4-GR)
Q840 L78MR05FA
AUDIO GND
AUDIO Vcc
QB30 2SC1815Y or 2PC1815Y
QB21 2SC1815Y or 2PC1815Y
QB20 RN1201
HD
VD
RESET
9V
HVcc
Q430 2SC3852 or2SD1944-H
Q431 2SC1815Y
D431 MTZJ8.2A
F470 T800mA L/250V LITTEL
L885 TLN3299D or TLN3155D
Z801 HIC1015 (HYBRID IC PROTECTOR)
FOR TEST
Q830 2SC3852 or 2SD1944H
Q421 2SC3852 or 2SD1944H
Z830 PRF1000
Q304 RN1202
D340 MTZJ2.4A
QV01
DG-COIL
L901 TSB-2333AR
P910 2P
R808 RZ92P2E180M3 orRZ99P2E180MS
S801 POWER SW
D801 D3SB60 orRBV406
F801
OTHER T3.15A L/250V
2173DN T5A H/250V
P801 POWER CODE
P802 2P
T801
OTHER TRF3219AM
2173DS TRF3118.G
TRF3148 TAIOOU

REFER LIST

	R661	R662	R663	R664
2173DD	6800	6800	2200	2200
OTHER	2200	2200	2700	2700



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C440	1.5KV5600pF	1.5KV5400pF

LIST OF DIFFERENCE FOR EACH MODELS

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sub data OPT	DAH	ASH	DDH	DBH	
CB11	68 PF	180 PF	180 PF	180 PF	180 PF
H001	TN-EGA11 (TN7)	TN-UFB11B (TN5)	TN-EGA11 (TN7)	←	←
H002	MVGS49 (IMA11)	MVGS48 (IMA8)	MVGS44A (IM91)	MVGS48 (IMA11)	MVGS44A (IM91)
C801	PHILIPS(RA) OKAYA(RB)	←	OKAYA	PHILIPS(RA) OKAYA(RB)	←
T801	TRF3219AM	←	←	←	TRF3118
F801	T3.15A L/250V	←	←	T5A H/250V	T3.15A L/250V
Q862	TLP621(RA) TLP721F(RB)	←	←	TLP721F	TLP621(RA) TLP721F(RB)
R832	2R27	OPEN	←	2R27	OPEN
R830	2R2.7Ω	2R3.3Ω	←	2R2.7Ω	2R3.3Ω
Q501	TB1226AN	TB1229AN	←	←	TB1226AN
RQ02	OPEN	←	←	←	OPEN
CQ02	1μF	←	←	←	1μF
GJ01	OPEN	←	←		
GJ02	OPEN	←	←		
GJ03	OPEN	←	←		
GJ05	SHORT	←	←		
GJ06	OPEN	←	←		
GJ08	SHORT	←	←		
GJ09	OPEN	←	←		
GJ10	OPEN	←	←		
GJ11	SHORT	←	←		
GJ12	OPEN	←	←		
GJ35	OPEN	←	←		
GJ36	SHORT	←	←		
GJ37	OPEN	←	←		
GJ38	SHORT	←	←		
GJ39	OPEN	←	←		
G101	PL-100	←	←		
G102	SHORT	←	←		
G103	SHORT	←	←		
G104	SHORT	←	←		
G105	PL-10	PL-10	SHORT	PL-10	SHORT
G106	TEM2011	←	←		
G107	PL-10	PL-10	SHORT	PL-10	SHORT
G210	SHORT	←	←		
G211	SHORT	←	←		
G212	SHORT	←	←		
G410	TEM2011	←	←		
G501	SHORT	←	←		
G616	1KΩ	←	←		
G888	SHORT	←	←		
G901	PL-100	←	←		
G941	SHORT	←	←		
G942	SHORT	←	←		
G943	SHORT	←	←		
GA77	SHORT	←	←		
GC01	SHORT	←	←		
GG24	OPEN	←	←		
GS02	PL-1	←	←		
GS03	680Ω	←	←		
GS06	680Ω	←	←		
GS07	PL-1	←	←		
GS08	680Ω	←	←		
GS09	680Ω	←	←		
GS10	SHORT	←	←		
GS44	680Ω	←	←		
GS45	680Ω	←	←		
GT04	1N4148	←	←		
GT05	1N4148	←	←		
GT06	1N4148	←	←		
GT21	560Ω	←	←		
GS11	SHORT	←	←		
GJ04	OPEN	←	←		
GJ34	OPEN	←	←		

SPECIFICATIONS (2173DF)

Input Power Rating:	80 W, AC 220 ~ 240 V, 50 Hz
Aerial Input Impedance:	75 ohm unbalanced type for VHF, UHF and CATV
Receiving Channels:	**SECAM L Standard:** VHF ..... channels B to C, 1 to 6, B to Q, 71 to 86 UHF ..... channels 21 to 69 **PAL B/G Standard, SECAM B/G Standard:** VHF ..... channels 2 to 4, 5 to 12 and S1 to S20, S21 to S41 UHF ..... channels 21 to 69 **PAL I Standard:** UHF ..... channels 21 to 69 **PAL, SECAM 50 Hz/60 Hz (For Video Disk playback)** **4.43 NTSC (For VCR playback), 3.58 NTSC (For VCR playback)**
Intermediate Frequencies:	Picture I-F carrier frequency ..... 38.9/34.47 MHz (L VL) Sound I-F carrier frequency L System ..... 32.4 MHz (L VH, U)/40.97 MHz (L VL) B/G System ..... 33.4 MHz I System ..... 32.9 MHz D/K System ..... 32.4 MHz
Picture Tube:	21 inches, A51EAL155X01 or A51EFS83X69, 510 mm (measured on diagonal of viewable picture area), 90° deflection
Sound Output:	10.0 W x 2 (at 10% Distortion)
Speakers:	120 mm x 60 mm oval, 2 pcs
Aux. Terminals:	21 pin socket (FULL), S-VIDEO, VIDEO/AUDIO INPUT socket
Dimensions:	Height 483 mm Width 632 mm Depth 485 mm
Mass:	21.4 kg

SPECIFICATIONS (2173DD)

Input Power Rating:	85 W, AC 220 ~ 240 V, 50 Hz
Aerial Input Impedance:	75 ohm unbalanced type for VHF, UHF and CATV
Receiving Channels:	**PAL B/G Standard:** VHF ..... channels 2 to 4, 5 to 12 and S1 to S20, S21 to S41 UHF ..... channels 21 to 69
Intermediate Frequencies:	Picture I-F carrier frequency ..... 38.9 MHz Sound I-F carrier frequency ..... 33.4 MHz Colour sub-carrier frequency ..... 34.47 MHz
Picture Tube:	21 inches, A51EAL155X01 or A51EFS83X69, 510 mm (measured on diagonal of viewable picture area), 90° deflection
Sound Output:	10.0 W x 2 (at 10% Distortion)
Speakers:	120 mm x 60 mm oval, 2 pcs
Aux. Terminals:	21 pin socket (FULL), S-VIDEO, VIDEO/AUDIO INPUT socket
Dimensions:	Height 483 mm Width 632 mm Depth 485 mm
Mass:	21.4 kg

Specifications are subject to change without notice.